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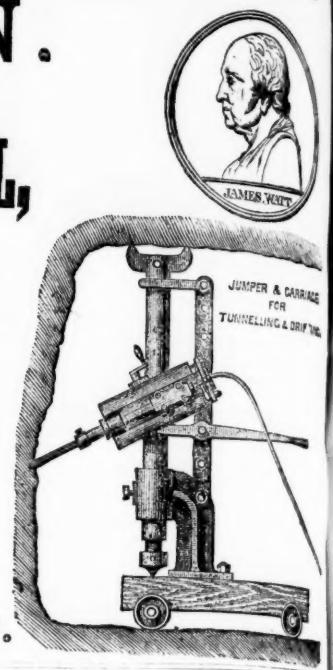
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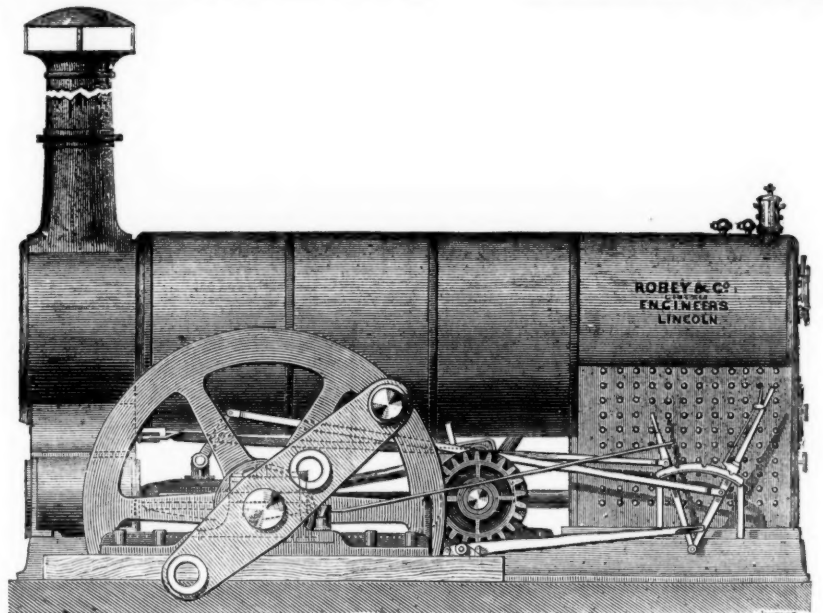
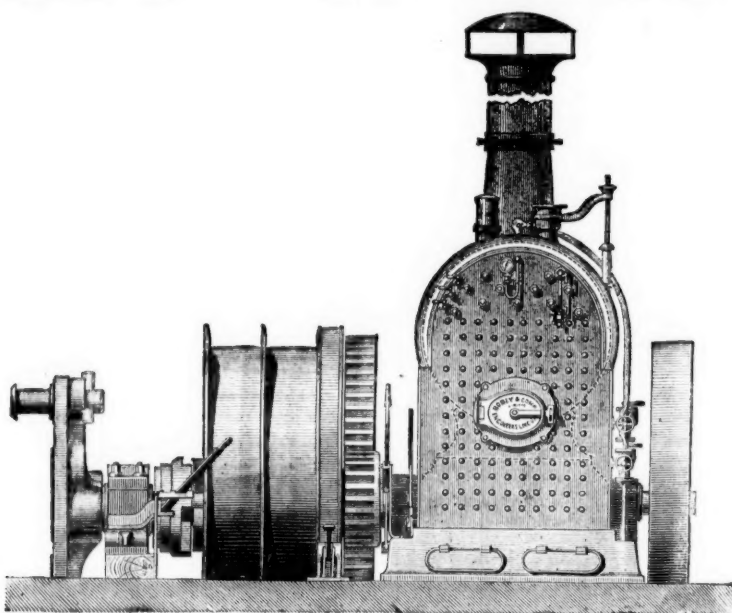
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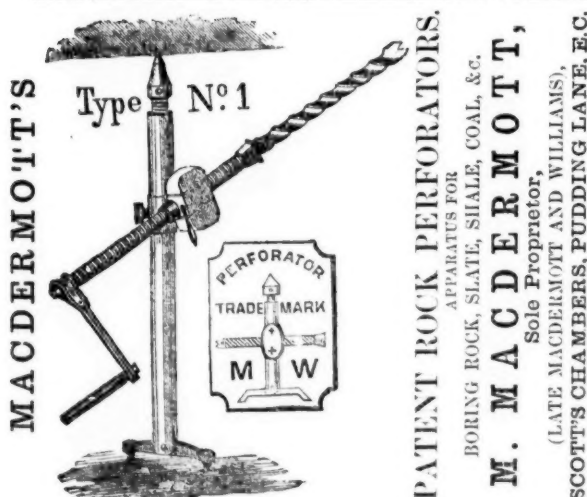
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Original Correspondence.

MINERAL STATISTICS OF THE KINGDOM OF SAXONY IN THE YEARS 1871 AND 1872.

SIR.—The "Year-book of the Mines and Smelting Works of the Kingdom of Saxony for the year 1874," having been issued, I subjoin the following tabulated summaries of the Mineral Statistics of that country for the two years 1871 and 1872, as I think they will interest some of the many readers of the valuable *Mining Journal*.
D. R. BURKART.
Bonn, May 15.

I.—SUMMARY OF THE NUMBER OF THE REGISTERED MINES, AND THE AREA OF THEIR GRANTS, IN 1871 AND 1872.

Classes of the Mines.	1871.		1872.	
	No. of mines.	Area of the grants.	No. of mines.	Area of the grants.
Metalliferous, and some other mines	307	Hectares, 29,883.30	312	Hectares, 35,492.80
Coal mines	86	11,325.19	101	12,598.71
Brown coal mines	176	2,188.88	217	2,709.84
Total	569	38,095.27	630	50,799.35

II.—SUMMARY OF THE PERSONS EMPLOYED AT THE MINES IN THE YEARS 1871 AND 1872.

Classes of the Mines.	1871.		1872.	
	No. of mining officers.	No. of working people.	No. of mining officers.	No. of working people.
Metalliferous, and some other mines	432	9,613	520	9,014
Coal mines	523	13,793	570	16,045
Brown coal mines	122	3,144	153	3,193
Total	1077	26,550	1243	28,252

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IV.—SUMMARY OF MINERALS RAISED IN 1871 AND 1872.

Description of minerals.	1871.		1872.	
	Quantity, Cwt. 50 kil.	Value, Thalers.	Quantity, Cwt. 50 kil.	Value, Thalers.
A.—Metalliferous minerals.				
1.—Miscellaneous ores delivered to the Fiscal Smelting Works at Freiberg.	548,306	1,710,787	490,796	1,662,005
2.—Tin ores	2,463	110,438	2,071	105,521
3.—Lead ore (blende)	25	127	43	223
4.—Zinc ore (blende)	1,006	338	—	—
5.—Iron ore	316,712	75,493	479,299	138,470
6.—Manganese	6,188	4,282	6,728	4,783
7.—Bismuth and bismuth ores.	1,137	193,141	856	131,635
8.—Cobalt and nickel ores, and nickel spiegeles	3,861	37,792	3,771	12,608
9.—Wolfram ore	117	247	91	171
B.—Earthy and miscellaneous minerals.				
10.—Arsenical pyrites and arsenic	1,184	727	1,873	740
11.—Iron pyrites and vitriol ores	4,720	1,094	4,654	718
12.—Iron ochre, and some other ochres	2,907	791	666	224
13.—Fluor-spar	6,842	1,497	12,037	2,897
14.—Barites	9,507	1,816	7,696	1,936
15.—Quartz	9,386	2,427	6,865	960
16.—Mica, and various other minerals	234	50	3	50
17.—Mineral specimens (scientific)	—	725	—	824
Total metalliferous and earthy minerals	914,095	2,141,788	1,017,148	2,113,534
C.—Combustible minerals.				
18.—Coal	57,768,268	10,159,978	68,925,223	10,888,360
19.—Brown coal	11,446,794	647,823	12,028,966	667,518
Total combustible minerals	69,215,062	10,807,801	80,954,189	11,555,878
Gross total of minerals raised	70,129,157	12,929,589	81,971,337	13,169,412

V.—SUMMARY OF THE PERSONS EMPLOYED AT THE METALLURGICAL WORKS OF SAXONY IN 1871 AND 1872.

Works.	1871.				1872.			
	Works.	Officers.	Males.	Females.	Works.	Officers.	Males.	Females.
A. Fiscal Metallurgical Works at Freiberg:—								
a. Smelting works and chemical manufactures	7	24	1191	29	1244	7	23	1191
b. Metallic and miscellaneous manufactures	5	2	42	8	52	5	2	41
B. Copper forge of Grunthal	1	2	57	—	49	1	2	54
C. Small manufactures of Schneeberg:—								
a. Fiscal manufactory at Oberschlema	1	8	83	—	91	1	8	85
b. Private manufactory at Pfannenstiel	1	8	114	—	122	1	8	110
D. Tin and bismuth smelting works	8	—	—	—	7	—	—	—
E. Iron smelting works	—	—	—	—	—	—	—	—
Total of A, B, and C	15	44	1487	37	1568	15	48	1481

* The persons employed are included in the number of working people of the mines.
† No returns have been received from this works.

VI.—SUMMARY OF THE PRODUCTIONS OF THE METALLURGICAL WORKS OF SAXONY IN 1871 AND 1872.

Description of products.	1871.		1872.	
	Quantity, Cwt. 50 kil.	Value, Thalers.	Quantity, Cwt. 50 kil.	Value, Thalers.
A. Fiscal Metallurgical Works at Freiberg:—				
1.—Gold in the parting	1,007	50,711	4,137	191,031
2.—Silver in the parting	621,434	1,850,003	891,067	2,675,615
3.—Copper, vitriol	30,744,402	227,005	26,721,730	248,437
4.—Bismuth	64,282	25,281	47,132	15,343
5.—Nickel	190,800	8,135	384,900	11,162
6.—Zinc and zinc dust	4,744,280	26,771	7,138,790	48,488
7.—Lead, assay—refined, soft, and antimonial lead, litharge, &c.	74,236,905	431,588	69,031,830	446,128
8.—Lead, shot	1,892,330	13,635	2,232,010	16,859
9.—Lead, sheet	5,892,772	38,288	8,312,820	68,904
10.—Lead, piping, tubing, and other lead manufactures	6,312,212	44,984	9,005,750	73,095
11.—Sulphuric acid	204,372,270	224,774	212,649,250	240,363
12.—Green vitriol, sulphate of soda, hydrochloric acid, &c.	7,954,190	9,028	13,732,290	15,649
13.—Arsenic, white arsenic, arsenious acid	22,516,695	92,530	15,802,547	73,873
Total of A.	359,483,640	3,037,935	365,858,083	4,066,072
B. Copper forge of Grunthal:—				
Miscellaneous copper manufactures	10,413,790	317,346	10,468,641	412,683
C. Small manufactory of Schneeberg:—				
1.—Small	7,030,751	315,234	8,476,980	211,145
2.—Nickel products	809,628	130,270	1,005,690	74,717
3.—Bismuth	432,939	166,178	231,620	121
4.—Arsenic	1,103,500	1,334	145,000	687,992
Total of C.	9,436,818	613,016	9,859,290	5,166,747
D. Tin Smelting Works:—				
Tin (metallic)	2,463,112	110,438	2,071,340	105,521
E. Iron Smelting Works (foundries):—				
Pig iron and cast-iron	255,146,000	441,910	—	—
Total of D. and E.	257,609,112	552,348	2,071,340	105,521
Gross total of A, B, C, D, and E.	379,334,257	3,968,397	386,178,014	5,166,747

* The value of the metallic tin produced is included in the value of tin ores enumerated in Summary IV., A, 2.

† The iron foundries and manufactures belonging to private persons have not made any return of their production and persons employed. Their production for the year 1871 has been supplied from other sources.

NOVA SCOTIA GOLD FIELDS.

SIR.—The value of the Nova Scotian Gold Fields having been officially vouched for by the Director of the Geological Survey of Canada, by many other disinterested well-known authorities, a very substantial gross, and high average yield, "argument," especially with anonymous scribbles—self-styled "Reviewers" and self-appointed Critics—who obtrude dogmatical contrary views, and whose opinion is neither sought for nor cared for by the public or investors, would be simply idle.—*London, May 21.* ACADENSIS.

MINING IN GERMANY AND FRANCE.

SIR.—A Berlin technical journal has published some information concerning the mining industry of Germany which has been taken up by the French papers, and in which comparisons are made between the different modes of mining in Germany and in France, and the diverse methods in which mining enterprise finds expression in the two nations. It will not be uninteresting to note shortly the distinctive points of demarcation as thus described. In the first place, it will be known by most of your readers that the organization of mines in Germany is very different from their organization in France. Whilst in France they are exclusively worked by companies of greater or less importance, which pay certain charges to the State, in Germany a great portion of the mines are either directly worked by the State or rented to private individuals. There are few of the mines which are not included in one of these two categories. The object of the State in Germany, it is pointed out, is thus very different with regard to mining than the object of the State in France. In Germany it is not confined, as in France, to the dispensation of rights of research or of concession—to a superficial control, principally exercised in case of accidents. In fact, the State in Germany, being the proprietors of most of the mines, and working them directly on their own account, or renting them to competent people, is necessarily interested in mining extension and development, in the good management of the mines, and in the progress of methods of exploitation. Thus, the official journal of mines publishes each year not only the statistical results of the working of the mines, but also the progress achieved in the methods of exploitation, the success attained by researches after new mines, and the new works undertaken which are likely to be of material importance. In fact, a very complete mining chronicle is thus kept in Germany, in much the same manner as is done by independent journalistic effort in this country, and the result in both cases cannot fail to be highly satisfactory. In Germany, also, the various mining districts are successively reviewed, attention being directed particularly to their production, rendered according to the actual weight and sterling value, to the number of workmen employed in the mine, the accidents which occur during the year, and other information likely to be of service. The contrast of mining management in Germany to that in France is considered by impartial authorities to be in favour of the former country.

Especially is the attention of those concerned in mining matters in France called to the abundance and regularity of the statistical information supplied by the Government in Germany about the mines, while in France there is a conspicuous deficiency in this respect. The good effects of this periodical publicity are evident, as is mentioned from two points of view—the control exercised upon the exploitation and the development of mineral riches. Attention is also directed to the progress of mining in Germany of late years. While its production of coal in 1860 did not equal that of France, at the present time it exceeds it by more than 20,000,000 tons—surely an important fact. It is urged upon the French Government, having regard to facts of this character, that it is incumbent upon them to do all they possibly can to develop the mineral industry of that country, and not to pursue a policy of apathy in regard to the matter which can never obtain the object in view. It is further stated that a society has just been projected in France to promote successful mining researches, and that this society has the support of many districts interested in the subject under consideration. This association, established with such meritorious objects, proposes to solicit the French Government to grant them an annual subven-

tion, and the importance of acceding to this request is seriously urged upon the authorities, as it would, doubtless, tend greatly to stimulate the work, and lead to satisfactory results. H. G. H.

ON HYDRAULIC GOLD WASHING.

SIR.—Allow me to pass a few remarks on hydraulic gold washing. Having seen a good deal of it, I am a great advocate for the principle, and wish to impress on the minds of the readers of your valuable Journal that it is generally a paying investment. It is well known that a vast amount of gold would never have been recovered but for the hydraulic process, as washing by any other means would not pay. But as all hydraulic works are in other countries, I will endeavour to draw your readers' attention nearer home, and I would refer particularly to North Wales. It is well known for centuries past that gold exists in Wales, but such a novelty as hydraulic washing, perhaps, has not been thought of: however, I would recommend a trial near Dolgelly—the River Mawddach having so much gold in it and its banks. For centuries past rocks have been decomposing, sulphurets oxidizing, and the rains have washed from time immemorial the soil and gravel to the level places at the foot of the hills. The valley fills up in different places, and gold from the innumerable veins, which is washed down, are amongst the auriferous deposit; at the present time gold can be found in the bed of the river, and on the sides. By washing with a batea, or wooden bowl, children have found gold in the different streams which flow into the river. The river receives the deposits from several known mines. The Gwynffynnydd, Dolfrwynog, Tydynglwydys, Cefn Coch, and several other veins, all producing gold. All these mines have added to the wealth of scores of acres of land on river banks. I am anxiously waiting to see an enterprising company commence working on the banks of the River Mawddach. It would add greatly to the wealth of Wales, and tourists to North Wales would see a grand sight in hydraulic washing and gold mining. Why spend millions abroad when you can personally inspect your own property at home?—*Dolgelly, May 16.* J. C.

DYNAMITE.

SIR.—As the Home Secretary is about to have an enquiry into the state of the law on explosives, permit me to make a few remarks in the Journal as to the safety and benefit (to all engaged in quarrying) of Dynamite. I have used dynamite now for ten months regularly, and have found it to be perfectly safe—much more so, indeed, than powder, as it burns slowly in the open air, and does not explode without a powerful cap. There is less risk in tamping the bore-holes, as a little loose sand or water is sufficient; whereas with powder the tamping must be hammered home, and if flint is present there is a chance, by no means uncommon, of cutting the fuse cord, and so missing the shot.

As an example of the benefit in hard white limestone, a hole 2 ft. long and 1 in. in diameter, will do more work (in fact, you must give it more to do) than one 3 ft. by 2 in. diameter. Boring is an item of great importance in quarrying, and taking the cost of the charge as the same in both cases, the saving is evident to anyone familiar with blasting. In under-cutting in quarries for falls it is invaluable; it is well known the last "foot" is generally the worst to get away, as the whole weight of the rock is on the top of it, and although it may be so shattered as to leave no space for a bore-hole for powder, yet it must come away often at a very great risk to life when it has to be worked out with crowbars. Dynamite does away with this, as a good charge even struck against the pillar will knock it entirely to bits.

I would use no powder in my quarry if it was not for the expense and difficulty of carriage of dynamite. I have to send a trustworthy man for it, and it adds on in my case 50 per cent. to the cost. In consequence of this I have to keep it for difficult shots, where powder would have little effect. I hope the present oppressive restrictions may soon be done away, as the law on nitroglycerine compounds, as it now stands, is a very serious drawback to many engaged in quarrying and mining, among the number—*ANTRIM.*

IMPROVEMENTS IN MINING;—BLAKE'S STONE-BREAKER—DYNAMITE.

SIR.—In order that Cornish mining may keep pace with the requirements of the times, it is necessary that needful improvements be promptly introduced into its various departments. Attempts have been extensively made during the last 20 years to improve the apparatus for dressing the various sorts of ores raised from the mines, so that the cost of putting them in the required marketable condition might be reduced, and the perfection of finish nearer approached to. Whether or not the desired success has been obtained is another matter. The large quantities of ores that escape detection in the dressing process give full proof of the requirement of yet further improvements. In one branch of ore dressing, however, it must be admitted a very important improvement has been introduced in the instance of Blake's Stone-Breaker, which is capable of reducing large rocks that come out of the mine at a much less cost than can be done by hand. The idea in chief of this machine being capable of great extension, the question suggests itself whether, by constructing it still larger and more powerful, it could not be with good effect made to crush rocks of a much larger size to advantage? This would be of great advantage to those tin mines whose workings are shallow, and tinstuff in large rocks.

The introduction of a new blasting material has created considerable interest among miners, in consequence of its economical superior advantages. The material I allude to is Dynamite. A considerable amount of misgiving and, perhaps, prejudice existed against it at first in this country, which, upon the test, is fast disappearing. The timidity of the miners to use it is lessening, and general confidence in its favour is being obtained. The advantages of its use in difficult and hard ground are unquestionably very great, when compared with ordinary blasting powders, in point of convenience of application, as well as superior execution. It is doubtful, however, whether the proprietors of mines generally are fully alive to the great advantages to be obtained through its use. Having tried it under sufficiently difficult circumstances, I am quite satisfied it conveys a benefit to mine adventures, where blasting has to be resorted to, of not less than 30 per cent. when compared with ordinary blasting powder. Its price, however, being very high (200% to 250% per ton), it is undoubtedly a practical question for the manufacturers of it to consider whether it would not be more to their advantage to render it to the consumer at a less cost, than provoke competition which is likely to arise from the introduction of other blasting materials of greater economy in price? Under any circumstances it is calculated to do mining and quarrying a wonderful service, the benefit of which cannot fail to be felt in the future. The introduction of Blake's stone-breaker and dynamite into Cornish mines and quarries is a tangible improvement.

Attempts have been made to introduce machines to bore holes in mines and quarries with greater rapidity. This I have long advocated, being thoroughly convinced of its need and practicability, and am quite satisfied it can be accomplished, notwithstanding the many failures that have attended the attempts to do so successfully. *Wenford, Bodmin, May 19.* GEORGE RICKARD.

WHITEHAVEN IRON COMPANY'S MINES.

SIR.—I read in a recent number of the Journal a statement that a railway was being constructed from Eskdale Mine to join the Furness Railway, near the village of Ravenglass. I was pleased to observe that the company had at length adopted a wise course of action, for without the railway no profit, I believe, was possible in working the mine. The payment of 8s. per ton for cartage absorbed the profit. I have no doubt that with a railway, when the mine is fairly opened, considerable or good profit will be made. The same railway will also serve South Eskdale Mine, where large deposits of iron ore await extraction when the transit of it to a shipping port, or to a railway in connection with smelting works, can be had. This property is in the hands of Mr. T. Harvey, of St. Clement's House, Clement's-lane, London, and who would do well, in my opinion, to obtain leave from the Whitehaven Company to connect his

Meetings of Public Companies.

LITTLEDEAN WOODSIDE COAL COMPANY.

The second ordinary general meeting of shareholders was held on Wednesday, at the Town Hall, Cinderford, near Newnham.—Mr. EDWIN CRAWSHAY in the chair.—Mr. JAMES M. JOHNS (the secretary) having read the notice convening the meeting, the CHAIRMAN said the profits for the last quarter amounted to 747l. 16s., which, with 228l. 8s. brought forward from the last account, gave them a balance at their disposal of 976l. 4s.—The statement of accounts and balance-sheet made up to April 30, 1874, having been read and adopted, it was resolved to pay a dividend at the rate of 10 per cent. per annum, carrying forward a balance of 433l. 11s. 11d. to the next quarter's account.—Mr. Alfred Ridler, the retiring director, was re-elected and Mr. George Morgan re-appointed auditor. Looking at the prosperity of the company under its undeveloped state, it was resolved that no further shares should be issued under a premium of 2l., or 7l. per share.—The CHAIRMAN said there were only a few shares on hand.—A vote of thanks to the Chairman and directors terminated the proceedings.

THE YORKE PENINSULA MINING COMPANY.

A special general meeting of shareholders was held on Tuesday at the London Tavern.—Mr. F. P. WARD in the chair.

The CHAIRMAN: Our meeting, gentlemen, to-day is quite a formal one, and is simply held for the purpose of confirming resolutions which were passed unanimously at our last meeting, on the 4th inst., to alter the Articles of Association. I will, therefore, move "That the following resolutions, which were passed unanimously at the special general meeting of the company on the 4th inst., be and hereby are confirmed."

Mr. GRAINGER (the secretary) here read the resolutions. Mr. GEORGE SMITH seconded the motion of the Chairman, which he then put to the meeting, and it was carried unanimously.

The CHAIRMAN: Gentlemen, I am glad to say that the company is now free from the technical difficulties which have hampered its action; difficulties unexpectedly created by legal decisions in the affairs of other companies, but which were applicable to us; and I hope that now, being free, we shall be able to carry out any views the company may have without being again impeded in any similar manner. We have not formed the favourable opinion we entertain of the Kurilla Mine without having obtained reliable reports from competent authorities. We have had the opinions of the mining captains of the Wallaroo and the Moonta, and Mr. Darlington, the London manager of the Burra Burra Mines, after very careful inspection. We have had the great advantage of the advice of Mr. Darlington throughout upon the matter of the Kurilla, as also with reference to the Bon Accord property; and I have reason to believe that the proprietors of the Burra, while their operations have lately thrown much light upon our adjoining Bon Accord property, are much interested in what we may do in that direction. I would particularly request your attention to the report and plan very recently received from Capt. Sanders, the resident manager of the Burra Burra, on the Bon Accord property. It was a very interesting and valuable report, and coming from him with the permission of his directors, may fairly be regarded as of much importance by us. A copy of it was issued with the circular relating to the resolutions which we have confirmed to-day. Now, our hope is that by exchanging the debentures into preference stock, and at the same time providing some working capital, we shall be doing what will prove to be best for the company and all parties concerned. It really ought to be a desirable stock to hold, because it is a first charge upon all the company's properties, in the immediate vicinity of which very great mining successes have been met with. If we are successful too—and we have fair reason to expect we shall be—it will, I repeat, form an excellent stock for you to hold, gentlemen, who have so long and so patiently waited for results, and who have now facilitated the exertions of the directors in so far as you have enabled them to exchange your debentures into preference stock, and to take steps to provide working capital. I believe that we have a good prospect now before us. I have only to add that I thank you for your attendance here to-day.

A SHAREHOLDER: I hope the Bon Accord and other properties of the company are in the meantime being carefully looked after.—The CHAIRMAN: That is so. The proceedings then terminated.

SOMORROSTRO IRON ORE COMPANY.

A special meeting of shareholders was held at the offices, Austinfriars, on Monday, to give the shareholders the opportunity of meeting the company's manager from Bilbao during his temporary visit to this country.—Mr. GEORGE BATTERS in the chair.

Mr. PERCY FRANKLIN (the secretary) read the notice convening the meeting.

The CHAIRMAN referred to the difficulties and drawbacks that had been caused by the Carlists, but stated that comparatively little, if any, damage had been done to the company's works. The company was now in this position—there was the prospect of resuming work generally in the course of a few weeks, and upon a small scale immediately. A letter had been received from B yonne that morning, offering them a price for Ollarzan ore; they had the Somorrostro steamer out there at their disposal for carrying on that trade, which, no doubt, would result in a very considerable profit; indeed, upon that trade alone it was not too much to expect a profit upon their entire capital. In order, however, to enable them to carry out a trade upon such an extended scale as their resources warranted—for everybody who had inspected the property confirmed the fact that they had the richest iron mines in the known world, and possessed facilities for working with cheapness—but, as he had already said, all they now really wanted was to complete the wire tramway from the present terminus down to St. Nicholas, where there were some of the best wharves in the port of Bilbao, and nearest to the sea of any company's works at the present moment. To complete the extension and construct four lines of wire tramway would cost an additional outlay to that already expended of about 11,000l. Responsible parties had offered to work the tramway and keep it in repair at a contract price of 1s. 6d. per ton. As far as the present capital was concerned, there were unissued shares to the amount of 5000l., represented by the mortgage on the Somorrostro steamer, and other small debts, so that the whole of the shares were practically issued, and as far as that went there was a clean bill of health. What the directors proposed to do was to issue 20,000l. worth of debentures, in order to complete the system of wire tramway, and to carry out the works in an efficient manner, and upon a large scale. The Articles of Association empowered the board to issue debentures to the extent of 30,000l., so that there was no need to apply to the shareholders for the authority, but they now stated it was the opinion of the directors that was the course they would most likely adopt; in the meantime, the moment the opportunity offered trade would be resumed, and, assuming there was no labour hindrance in point of finance, the system of wire tramways would be completed, when it was calculated the output would be from 700 to 800 tons per day, resulting in a large and profitable trade. There appeared a fair prospect that the directors and their friends would subscribe something like one-half of the proposed issue of 20,000l., so that there could be no reasonable doubt that the remaining 10,000l. would be readily obtained.

Mr. TAMPLEY asked if the wire tram system had been tried?—The CHAIRMAN said that many hundreds of tons had been brought down over the line; and if the company determined to extend it an offer had been made them from responsible parties to work it for 10 years, keep up all renewals, and give up the line to the company at the expiration of the contract, and bring down the ore for 1s. 6d. per ton. If that could be done it would be far cheaper to the company than a locomotive line.

Mr. MARTINEZ said he had worked the wire-tramway for some months; at first there were some difficulties in its details, but it now worked perfectly satisfactory, and with the alterations and extensions proposed he fully believed the line would not only continue to work well but would also last well. The present two small lines had brought down for several consecutive days 250 to 300 tons per day, and with the four proposed lines they might reckon on 1000 tons, but he would rather put it down at 700 to 800 tons per day. From the above-bridge mines the railway brought 200 tons per day, when they were stopped by the insurgents.

A SHAREHOLDER asked the entire cost of conveyance?—Mr. MARTINEZ said it was from 32 to 35 reals f.o.b., equal to about 6s. 6d.

The CHAIRMAN said the cost at the great iron mines of the country—the Campana—was much higher, with all the appliances capital could give them. The Somorrostro Company could bring ore down at prices so low that no one could compete with them. The Bilbao Railway Company, who had put very large trucks on their line for the accommodation of this company, had suffered very little damage.

In reply to questions, the CHAIRMAN said they were under contract to supply 100,000 tons per annum for 10 years, so that they stand in a first-rate position to make profits. The position of the company for sales was good as well as its working, and a very small outlay would make it very much better.

Mr. MARTINEZ, in reply to a question, said that it was possible as good ore as the Moro and Ollarzan might be found, but better could not be, nor in such a good position for shipping. The wire-tramway would eventually be about 4½ miles long, and the offer for working it at 1s. 6d. per ton was from responsible parties.

The CHAIRMAN asked Mr. Martinez when it was likely they would be able to get to work?—Mr. MARTINEZ said that in the above-bridge mines they would be able to get to work immediately, and at the others in about two months. There were

now 9000 to 10,000 tons ready for shipment, and nearly the whole of it was brought down by the wire-tramway.

Mr. CARR was decidedly in favour of the extension of the wire-tramway, and, as a director, had very carefully considered the subject of the desirability of constructing a railway, and had come to the conclusion that it would be most unwise to do so at all events, for the present. Shareholders should be reminded that the wire-tramway and all other arrangements had just been brought to bear when they were stopped by the insurrection; and the winter before last was the worst recollected in Spain, so that hitherto everything had been working against them.

Mr. MARTINEZ mentioned that the latest advices from Bilbao were to the effect that the residents were much pleased with the promises made by General Concha, and with the way in which he was going to work—he had promised the railway should be opened for traffic in two months.

The CHAIRMAN said they were at the present time in a position to load their own steamer with Ollarzan ore, and were offered profitable employment; the steamer would carry 500 tons, and could make one voyage per week with the greatest ease; but in a few weeks there was every prospect of being able to resume their operations, when their output should be 500 to 600 tons per day.

Mr. MARTINEZ said their present minimum output was 400 tons per day—that is, with their present arrangements, and that was sufficient to fulfil existing contracts, giving them an average profit of 4s. per ton.

Mr. SCOTT had understood there was some idea of amalgamating this company with the Cantabrian Company and a fleet of steamers.

Mr. CARR said he would have been very glad to see this amalgamation brought about, but difficulties had been thrown in the way by two or three shareholders in the Somorrostro Company.

The CHAIRMAN said that some gentlemen, who had invested largely in the company, and had been offered for their shares, said they were perfectly satisfied with their investment, and preferred the company to remain as it was. There was no doubt that if the amalgamation could be brought about it would be one of the most successful enterprises ever established.

The CHAIRMAN said that during all political struggles in Spain private property was always respected. No fear need be apprehended under that head, while, on the other hand, the company's property was freehold, in such a position, and the quality of the ore such, that the ironmasters must have it. There was no doubt whatever that profits would soon far more than make up for previous disappointments. He suggested that the matter should be left in the hands of the directors, something like 11,000l. would be required for the extension of the tramway.

After some further discussion, it was unanimously decided to leave the matter in the hands of the directors.

A vote of thanks to the Chairman and directors closed the proceedings.

WHEEL CREBOR.

A special general meeting of shareholders was held at the offices, St. Michael's House, on Tuesday, for the purpose of making such change in the management of the mine as may be then thought desirable.

Mr. HENRY EMMANUEL in the chair.

Mr. JERU HITCHINS (secretary) read the notice convening the meeting.

The CHAIRMAN said the object of the present meeting was explained in the notice.

Mr. WARD complained of the discrepancies in Captain Goldsworthy's reports as compared with the returns.

Capt. GOLDSWORTHY said he had not made any report that had not been borne out by results, and Mr. WARD's agent had furnished a report very much stronger than any he had ever written. He was perfectly sure the quantity of ore returned was very much greater than ever he had indicated in his report.

Mr. J. Y. WATSON said that directly the committee talked about a change in the management the mine seemed suddenly to become poor.

Capt. GOLDSWORTHY said he could not see through the ground, and in a mine like Crebor changes were constantly occurring.

Mr. LANE said the question could be easily settled by ascertaining if the ground spent and the returns therefrom agreed with the valuations in Capt. Goldsworthy's reports.—Mr. HITCHINS said he had not gone critically into the question, but as far as he had seen the ground had produced valuations.

Capt. GOLDSWORTHY said that no man could see through the ground; what he had reported upon were the drivages, and what he had reported had been returned. He could not tell how far the ore was going to hold up or down. He would stand by his reports, and by the opinion of any independent man who might measure the ground spent as against the returns made.

Mr. WARD said that the opinion of his agent was that the mine justified its being worked quicker.

Capt. GOLDSWORTHY said the cry had always been—"Keep the costs down!" but he had no hesitation in saying that there was not a mine in either county where there had been so much work done at such a small cost.

After some further discussion, Capt. J. Andrews, who had inspected the mine, and whose report was very favourable, was appointed the agent of the mine.

A vote of thanks to the Chairman closed the proceedings.

BOTALLACK MINING COMPANY.

A quarterly meeting of the adventurers was held at the mine on Wednesday, when the accounts—on this occasion the fourth month being charged—were produced by the purser, Mr. S. H. JAMES, and showed the following payments:—Wages, 4830l. 6s. 2d.; coals (943 tons 13 cwt.), 942l. 15s.; carriage, 349l. 5s.; Stannary assessment, 13l. 5s. 6d.; Batten, Carne, and Carne, interest and commission, 100l.; rents, 50l.; merchants' bills, 853l. 12s. 10d.; total, 7139l. 4s. 8d. The receipts had been—Copper ore sold (48 tons 18 cwt., for 650l. 1s. 8d., less 1-18th duties, 36l. 2s. 3d.), 613l. 19s. 5d.; 68 tons 15 cwt., 299l. 17s. 6d., of tin ore sold from Botallack (3605l. 6s. 9d., less 1-24th duties, 1507l. 11s. 4d.), 5154l. 15s.; 30 tons 13 cwt., 299l. 17s. 6d., of tin ore from Carnvon (1600l. 8s. 3d., less 1-24th duties, 60l. 13s. 8d.), 1538l. 19s. 7d.; sundry credits, 238l. 6s. 7d.; total, 5840l. 15s. 7d. Loss on the quarter, 1298l. 9s. 1d. Add this loss of 1298l. 9s. 1d. to the unfavourable balance at the last account, of 4658l. 15s. 8d., and there is 5956l. 4s. 9d. But calls have been received since the last meeting amounting to 1748l. 2s. 6d., leaving a present debit balance of 4208l. 2s. 3d. To lessen this it was now resolved to make a call of 7l. per 200th share, payable in two instalments of 4l. and 3l. This will reduce the balance to about 2800l.; 97½ tons of tin have been sold, at an average price of 33l. 6s. per ton. When we add that this 10l. per ton under the preceding quarter, and 30l. per ton under the corresponding quarter of 1873, it will readily be seen how seriously and directly the lower price for tin affects this large enterprise. The last prices received for tin here were 57l. 10s. for No. 1, parcel down to 54l. 10s. for other and inferior lots.

Capt. F. Bennetts, F. Oats, and H. Hosking report that in the higher mine there are 54 men and boys breaking tin. At Wheel Cock the new shaft is cut down, and the skip-rods are nearly completed to the 112. The 100 shaft is opening some good mineral ground, and there is some copper ore in the mine under the 100 west. Five pitches are here working for tin and copper on tinwork. In Carnvon the lode at Pearce's shaft is large, and producing tin throughout. They hope next month to commence driving on the Winnowing Stock lode, in the 30, on the Guide. At several other points in the mine paying tin ground is being opened up; 21 pitches are working for tin on tinwork, and 1 on tribute. During the past quarter (write the agents) the very low price of tin has compelled us to reduce the number of men employed in opening out the mine. We hope at our next setting to resume some of the most important points at present suspended. The ground opened in three months in shafts, winzes, and levels is 200 fms. 2 ft. 5 in."

After dinner, Mr. N. B. DOWNING, of Penzance, one of the committee of management, proposed the health of the purser, and thanked him, on behalf of the shareholders, for the anxious and unwearied attention he had given to the affairs of Botallack during the past quarter. Their acknowledgments were due to him and to the agents for the efforts they had made to economise in every way consistent with the proper development of the mine. He hoped that, even with the present lamentably low price of tin, the worst of their days were over, but all confidently expected better prices. Two encouraging circumstances were now pretty well established, that Australia could not produce tin remuneratively below a certain figure, and that tin was—it might be slowly, but for certain surely—becoming more and more in demand in every part of the habitable globe. If all who were interested in Botallack only exerted themselves untidely, and with determination, the mine would again prove a source of handsome profit to its proprietors, and what was nearly as much importance—of wide-spread service to the labour market and to the manufacturing interests of the neighbourhood.

Mr. JAMES admitted the difficulties and the depressing influences of recent times, and how much he was indebted to the valuable and incessant labours of all around him. He shared in the belief that the worst was over. A little rise in tin would enable them to materially lessen their loss, which he trusted would be much reduced next quarter, and with anything like a proper price Botallack would pay, even on its reduced scale of working.

Capt. F. BENNETTS, while he joined in the belief that the darkest clouds are passing away from mining generally, earnestly hoped for a much brighter sky, because he wished not simply to continue the present operations but to open up many promising points at present suspended.

WEST WHEEL SETON MINING COMPANY.

At a meeting of adventurers, on Friday, Mr. O. MATTHEWS, the purser, presiding, there was a large attendance, and the accounts showed there was a loss on the three months of 475l., and the credit balance at last account (1416l.) is now reduced to 940l.

The agents' report stated that the lode in the 130 west, on the north part, produces 5 or 6 tons of copper ore per fathom, worth 35l. per fathom. There is more of the lode standing south. The lode is 4 ft. wide, and its appearance is very encouraging for the western ground. In the 120 west they propose to sink a winze to come to come down upon this ore. In the back and bottom of the 140, west of Hilderley's shaft, there are four stopes—three in the back and two in the bottom of the 120, and one in the back of the 110, east of Harvey's shaft, 10 in all, producing the aggregate of 35 tons of copper ore per fathom; they are also worth for tin in an average 9l. per fathom, and there are four stopes of tin, worth on an average 15l. per fathom.

Capt. BATR, in reply to a question as to how long he thought it would take to drive the 140 to cut this lode, said that there would be 15 fathoms to drive, and about 8 fathoms to cross-cut north; that would take in all about nine months.

Mr. RULE advocated the sinking of a winze instead of stoping in the bottom of the 120. The men at present were a good deal occupied in drawing water and stuff. They were paying 8s. a ton for breaking tinstuff, and 32s. a ton for breaking copper. If they put in a winze it would only cost 4s. or 5s. a ton; and where the men broke 100 tons of tinstuff and 30 of copper in the two months, they would be able to break 400 tons of the former and 100 of the latter.

Capt. BATR replied that the agents had not the slightest objection to sink the winze, but they had been obliged to force the work at that point in order to pay their costs. Had they stopped to sink that winze they would have made even more calls than they had already done, because it would have been impossible for them to have kept up their returns. At the request of the adventurers themselves the agents had been doing their best to keep down their costs and to maintain their returns at the same time.

Mr. RULE mentioned that in Dolcoath, at the 300, twelve men broke 400 tons of tinstuff in two months, while at West Seton, the 120, ten men who were employed half their time in drawing water and stuff only, broke 100 tons. If they

of the Mining Journal inform me of any firm in the coal or iron manufacturing districts that would allow a manager that was in receipt of a large salary to become the so-called manager of ten other firms, with ten times the amount of guineas, and a visit twenty times less of their services? If so, I shall feel obliged. There are mine managers placed in this position from two to five guineas, to go from 20 to 80 miles accompanied by a cheque for their numerous correspondents, and a visit to inspect some other mine a week to meet the merchants who supply the various materials to the market towns, and one day in each month to each mine to receive the amount of guineas their position entitles them too. The end of every week makes them—Glad there is a day of rest so near."

CAMELFORD AND ST. BREWARD, OR SIMONWARD, AS NEW MINING DISTRICTS.

SIR.—I quite agree with Capt. Ennor's remarks in last week's Journal, as I am conversant with the facts stated by him as regards the lodes in this district. The Great Onslow Consols is the mine he refers to as only opened upon on the lode for about 70 fathoms; this mine is on the east of the River Camel in killas partly, being on the junction of the granite and killas. South of this mine a very fine lode has been opened, to which Capt. Ennor refers. To the north of the lode has been opened, there are two more very large and fine lodes, which Great Onslow, in the same hill, composed of fine gossan, mudic, and black and were opened a few years ago, more than sinking a few feet on the backs, yellow ore; nothing was done on them more than sinking a few feet on the backs. The situation is at a very great depth, so as to give at least 70 to 80 fathoms to be brought in at this range of hills is the River Camel, containing a sufficient amount of continuous water-power to sink shafts to a very great depth if required. These untold lodes are on the east side of the river, while about ½ mile further up, and on the west side of the same river are other fine copper lodes, which some years ago were merely opened on the backs: strong masterly lodes, composed of gossan, mudic, and spots of ore. These lodes can also be worked to any extent by the water-power of the River Camel. Continuing to follow up the river, and on the west side, are indications of more copper lodes, but nothing has been done on them. We then reach a little further up the Trethin Mine, to which Capt. Ennor refers; I have no great opinion of the copper lode here, which is generally small, and does not carry much gossan on the back; it, so far, has mostly run in a hard blue clay, which is undoubtedly very large, and has in places squeezed up the lode to a very small size; until the ground changes and the lode becomes larger, as it proceeds, it will be in a lead lode, worked many years ago, but to no same set, further east, there are some good stones of lead were raised from profit; the workings on this lode is much easier than that about the copper lode, and it; the ground prospects for lead are better than for copper at present. There is I consider the prospects for working these lodes. The section given by Capt. Ennor is ample water-power in a general point of view, showing the positions of the lead and quite correct, the latter adjoining the granite. This lead district will copper bearing strata, the important one I have no doubt, as there are well-known eventually become a very important one. The present pay of about 12s. per ton of this mineral in the several parishes of Lankester, by Camelford, St. Teath, Machelstow, St. Kew, Endellion, and St. Minver. Having carefully noted what has been discovered in the outlay of capital several good mines may be found, believing that by judicious work for further information on this subject, I shall be able to give you as far as lies in my power. I am not a second Capt. Ennor, happy to supply a great reduction in the cost, but I volunteer this information, hoping it may be for the good of the district, which to a certainty contains copper and lead lodes, which can be in many instances cheaply worked. You can give my name and address to anyone wishing to communicate with me.

SHAREHOLDER.

THE PROVIDENCE MINES.

SIR.—At the special general meeting of shareholders, held at the counting-house, on Tuesday, it was resolved to commence operations as soon as possible, but at a considerably less managing cost. In the place of the late respected purser, and I might almost with safety say and manager (Mr. S. Higgs), Mr. Edward Trythall was appointed purser, at a salary of 100l. per year, and for this amount alone is to do the whole work as required to be done by the purser, including clerk and travelling expenses, which is a great deal less than the late respected Mr. Higgs's salary, which, if I recollect rightly, was 12l. 12s. per month, with about 8l. per month for a great reduction in the cost. The present pay of about 12s. per ton of this mineral in the several parishes of Lankester, by Camelford, St. Teath, Machelstow, St. Kew, Endellion, and St. Minver. Having carefully noted what has been discovered in the outlay of capital several good mines may be found, believing that by judicious work for further information on this subject, I shall be able to give you as far as lies in my power. I am not a second Capt. Ennor, happy to supply a great reduction in the cost, but I volunteer this information, hoping it may be for the good of the district, which to a certainty contains copper and lead lodes, which can be in many instances cheaply worked. You can give my name and address to anyone wishing to communicate with me.

SHAREHOLDER.

SOUTH PHOENIX TIN AND COPPER MINING COMPANY.

SIR.—Allow me a short space in your valuable Journal to express a few thoughts respecting the management of this mine. Though generally understood in this neighbourhood that South Phoenix is one of the most promising young mines in the county, yet scarcely a week passes without hearing from many interested in mining expressions similar to this—"South Phoenix would undoubtedly become a good mine were the management more spiritedly conducted." It is this conviction, depend upon it, which prevents many persons having experience in Cornish mining from taking an interest, or from feeling justified in an outlay of their capital, in the undertaking; but it passes my comprehension to understand why an experienced agent always on the mine and a manager beside in a small concern like South Phoenix should be thought necessary. In addition, we have a committee of management, or board of directors. I have not yet been informed in what way they are remunerated. Do each receive monthly pay, or is it put into one round sum, and called expenses of some kind? I may be singular in this respect, but really I think some of the round sums in the balance-sheet should be particularised, especially as I consider some of them rather heavy amounts. This expense question is a very important one, especially when we consider how much more has to be done to make the mine self-supporting. It is true, according to the report, Pearson's shaft is sunk 34 fms.; but comparatively little ground is yet opened out, and preparations made for taking away the lode. Driving and boring from on level to another requires expense to sink. With regard to the board of directors, I have not the least doubt but they are all gentlemen of high standing, and thoroughly business-like in the fullest sense of the term; but can it be expected of them to be able to give instructions as to the most practical and economical development of a Cornish tin mine, apart from the advice and opinion of someone more practical than themselves? Of course the manager is expected to perform this important duty. Then the question naturally arises—Is the manager at South Phoenix fully qualified to do this? I am not acquainted with him, but have been told, and believe him to be a highly respectable gentleman in other respects, but I maintain it is in the highest importance he should have a practical knowledge of his work. As I have already said, I certainly think one practical agent is all that is required, especially at the present and for some time to come, for I have my doubts in a prolonged working of the mine if more economy is not used, and some of the present expenses curtailed. I have never spoken to Capt. Kelly, but have made enquiries respecting him on several occasions, and for my own part I am perfectly satisfied that we cannot place a better man on the mine, for I am told that he is thoroughly practical, strictly watchful, and economical. In conclusion, let me say that my object in writing is not to give offence to anyone, but simply to state my own convictions, and the general feeling in this district.

A SHAREHOLDER.

[For remainder of Original Correspondence, see to-day's Journal.]

BOLTS AND SPIKES FOR THE NEW ZEALAND RAILWAYS.—Messrs. P. and W. MacLellan, of the New Clutha Ironworks, Glasgow, have just concluded a contract to supply between 500 and 600 tons of bolts and spikes for the New Zealand railways, a branch of manufacture in which an eminent reputation has been attained by the firm. It is stated that this is the largest order for such goods that has ever been executed by any bolt and nut firm in Scotland. Messrs. MacLellan are now nearly finished with an order for 150 tons of bolts for the Indian State Railway, and they have recently booked orders for very large quantities of bolts and nuts for the Lords of the Admiralty. In the course of a week or two the branch establishment of Messrs. P. and W. MacLellan, at Rose-street, Hutcheson-town, Glasgow, will be brought to a close, when the whole of the manufacturing business of the firm will be concentrated at the New Clutha Ironworks, under the management of Mr. J. P. Smith, C.E., late Secretary to the Institution of Engineers and Shipbuilders in Scotland.

BREAKFAST—EPPS'S COCOA—GRATEFUL AND COMFORTING.—By a thorough knowledge of the natural laws which govern the operations of digestion and nutrition, and by a careful application of the fine properties of well-selected cocoa, Mr. Epps has provided our breakfast tables with a delicately flavoured beverage which may save us many heavy doctors' bills.—Civil Service Gazette. Made simply with boiling water or milk. Each packet is labelled—"JAMES EPPS AND CO., HOMEOPATHIC CHEMISTS, LONDON."

MANUFACTURE OF COCOA.—"We will now give an account of the process adopted by Messrs. James Epps and Co., manufacturers of dietetic articles, at their works in the Euston-road, London."—See article in Cassell's Household Guide.

HOLLOWAY'S PILLS.—MEDICINES FOR THE SPRING.—Diseases latent in the system throughout the winter will manifest themselves in milder and more from weather unless the blood be freed from impurities, and the body generally put in a healthy state. Holloway's pills have long since established the highest reputation for the full and efficient manner in which they accomplish the purifying process. These excellent pills search every organ, pervade every tissue, and successfully grapple with all deleterious substances, either by neutralising them or expelling them. Holloway's medicine promotes comfort, cheerfulness, health, and strength. The medicine is admirably adapted for the weak and delicate, whose frames are relaxed, whose nerves are unstrung, and whose spring's variations are upset alike by winter's cold and indigestions.

sunk the wine he believed this might be increased to 600 tons.—Capt. BATH said that it would take four or five months to put a wine through there.

Mr. RULÉ believed they could put it through in four months, pay costs, and pay a dividend.—Capt. JENNINGS said they could not rise from the 130 at less than 301. a fathom.

Mr. BUDOR asked if the sinking of the wine would reduce the returns? Capt. BATH replied that it would for the time. The agents were quite willing to sink the wine.

Mr. HENDERLEY said the question was a very important one for the mine, and, taking all the circumstances into consideration, he thought it would be advisable that they should call in, as an assistant, Capt. Josiah Thomas, of Dolcoath, who should consult with the agents, and they with him, as to the best course to be pursued. In this way they might bring the matter to an equitable and just conclusion.

Capt. TYRRELL: Capt. Bath knows very well that the proper thing to do is to sink that wine, but his hands are tied, and, therefore, he has not done it. I do not see why we need call in anybody else.—Mr. H. MAYNE: There is a feeling outside that we have too many agents already, and surely we do not want any more.—Mr. HENDERLEY: We have a very important mine here, and it only requires a little judicious working to make it as profitable as it has been before.

Mr. TREGILGOS said it was a very strange thing to him if neither of their three agents knew how, or when, or where to put down a wine. His own opinion was that the matter might very safely be left in their hands.—Capt. PASCOE believed the agents were working the mine in the best way they could, but if the adventurers restricted them in their work the agents were not to blame.—Mr. HENDERLEY denied that they were restricted. On the contrary, they had received a *carte blanche* to exercise their own discretion in the working of the mine.—Mr. WILLIAMS was of opinion that there would be no cause of complaint if the agents were allowed to work the mine in a miner-like manner, but they could not do this if their hands were tied.—Capt. JENNINGS added that if the agents had not been curtailed the work of the 140 would have been done before this.

Mr. RULÉ was satisfied that West Seton was a very rich mine still. The men had pulled up in the 120 as much as 800 barrels of water in one week. Let the wine be sunk and all this would have been avoided.

Capt. PASCOE said it was impossible that the agents could work the mine fairly if they were incessantly badgered with contradictory instructions and directions. It was better that they should be allowed to act as they thought best.—Capt. BATH: We cannot give satisfaction if we are limited in our operations.—Mr. HENDERLEY: You cannot complain of being limited, because you have always had a *carte blanche*.—Captain BATH: We have been limited during the last three months.—Mr. RULÉ stated that he had taken samples out of the river in the valley just below the burning house, and found on assay that the stuff there running away to waste contained 19 lbs. 9 ozs. of tin to the ton.

Capt. B. DAVEY said this statement was most unfair, and calculated to mislead those who were not acquainted with the real facts. According to Mr. RULÉ's assertion, any stranger would fancy that the agents were carelessly allowing the tin to run to waste. This was not the fact, but the real fact was that below where Mr. RULÉ took his sample the stuff of which he spoke was collected and re-dressed.

Mr. RULÉ did not deny this; but held that more tin ought to be taken out before the stuff was allowed to enter the river. Mr. Perry boasted of the tin he got from West Seton.

Capt. JENNINGS said there were 94 frames, six buddles, and five slime pits below the spot whence Mr. RULÉ took his sample. This would show that there was no neglect on the part of the agents.—*West Briton.*

ALMADA AND TIRITO SILVER MINING COMPANY.

The half-yearly meeting of shareholders will be held on Friday, when the following report from the directors will be presented:—

The directors have much pleasure in submitting their report and statement of accounts for the half-year ending Dec. 31st, as also the manager's report embracing the same period. The shipments of ore and stock on hand show an excess of 166 tons over the previous six months, although the result of the parcels arrived and realised does not, owing to the low prices obtained, show a correspondingly large increase. According to the new tariff issued in Germany, poor silver ores are purchased at the Government smelting works at a much lower figure per ounce than those which are richer, the scale ranging from 4s. to 5s., according to quality. The board, with the view of obtaining better prices from English smelters, have systematically checked the German account sales by assay and valuations here, but they have had no instrument as yet to order cargoes to England. The scarcity of water, owing to the small quantity of rain last wet season, has considerably crippled the produce of concentrated ores, but arrangements have been made by which it is hoped that ores may be shipped in bulk at the local port of Agiavampo so soon as the Mina Grande shaft yield sufficient to induce ships to call there for freight. By latest dates the board are advised that the crusher was nearly ready to go to work; by its means the produce of saleable ores will be greatly increased; the schooner, meanwhile, is making regular trips between Agiavampo and Mazatlan, the calling port for steamers. Under date March 9, Mr. Clemes expected that the communication between the tunnel and Mina Grande shaft would be completed before he would again write, or in about a week from that time. The plan of dry concentration has also very much occupied the attention of the board and Mr. Clemes, but after mature consideration they have decided that the system, although adopted and in use in some parts of California, is not suitable for this company's purposes. Mr. Clemes has, therefore, submitted to the board a proposal for obtaining a permanent supply of water from a spot about five miles off; this would entail an expenditure of from 8000l. to 10,000l., but the vital importance of the question renders it most expedient that either the manager's present plan, or some other similar one, should be adopted in order to avail of the greatly increased output which may reasonably be looked for when the Mina Grande is laid open for working on a large scale.

It is hoped that the assistant manager, Mr. Breach, whose agreement with the company expired early in April, will be in England in time to attend the general meeting, and give the shareholders all the latest information from the mines. The board will defer any action on the water question until they have consulted him on the subject, and also ascertained more fully Mr. Clemes' views. The Almada property on the north side is bounded by the Dios Padre Mine, a sett larger in extent than both this company's properties together. The most northern workings of the Mina Grande are believed to be in black ore, and about 30 yards from the northern boundary; it was, therefore, evidently highly important that this company should, if possible, become the owners of this mine, and a favourable opportunity having occurred of doing so, they, acting on Mr. Clemes' urgent representations, telegraphed to him to secure it. The board are now happy to report that the mine has been purchased with a clear fresh title granted under "deed of sale" by the local Government for the trifling sum, including the attendant expenses, of 1000l., which amount Mr. Clemes states he can defray out of the returns without drawing upon the company. So important did the manager consider it that this mine should become the property of this company that he was prepared to purchase it at all risks had the instructions of the board not reached him in time.

The directors being of opinion that it would be inadvisable to continue absorbing all the revenue of the company to pay for the water supply, new machinery of various sorts which the increasing development of the mines has entailed, and the new property just purchased, will submit a resolution to the shareholders asking for the issue of not exceeding 20,000l. debentures of the company at par, bearing interest at not exceeding 10 per cent. per annum, repayable by annual drawings of 20 per cent., the first drawing to take place on June 30, 1877. They consider, and in this Mr. Clemes fully concurs, that the want of working capital has much delayed the prosecution of many necessary works which have had to be gradually executed and paid for out of revenue, and that having done so much out of this source sufficient money might now be released by the issue of debentures to enable them to propose the declaration of a dividend. After writing off the balance of preliminary expense account the net profits for the half-year amount to 4806l. 12s. 2d., the total at credit of revenue such as above, 14,824l. 11s. 5d., which exists as shown by the balance sheet in store, ores in course of reduction in Mexico, and those for shipment and on the road.

The report of Mr. J. P. Clemes, Manager of the Almada and Tirito Mines, for the half-year ended Dec. 27, says:—

During the six months just ended the quantity of ores raised and sent to the surface amounted to 6341 tons. The yield of clean ores from the mine was as follows:—Patio ores, 2587 tons; black ores, 2082 tons; black stone ore, 113 tons; and petanque, 1 ton. Net yield after concentration, 1772 tons patio ore, and 309 tons black ores, &c., for shipment. The average value per ton of rough ore was 819.43; ore prepared for the stamps, 925.76; and patio ore 937.66; against 1615.56, 826.04, and 942.65, the average values respectively during the previous half year. The ores reduced here realised 97,428.77, and the ores for shipment have an estimated net value of 225,794, free of carting, transport, freight and sale charges. Total net value, 123,222.77. Working expenses, 89,487.80. Profit, 32,734.97. These results compare with those of the preceding half-years as follows:—

	Dec. 1873.	June 1873.	Dec. 1872.	June 1872.
Half-year's credit	115,415.73	114,213.69	142,023.35	123,222.77
expenses	74,368.37	59,784.14	97,174.61	90,487.80
profits	41,047.36	54,429.55	44,848.74	32,734.97

At the commencement of the half-year I estimated the monthly profit to be expected at \$8000 per month, or say \$48,000 for the six months. The figures given above show in round numbers \$15,000 less. This difference is not attributable to a falling off in the produce of the mine, for although the quantity of black ore raised was somewhat less, the silver reduced here was rather more, neither was there any excess of expenditure not foreseen. It is due chiefly to the selling prices of the ores shipped. On this account, in November, I had to write off \$10,520 depreciation in value of export ores on hand, and since then have had to estimate values at reduced rates; besides having previously, as I believed, estimated the values below the ordinary standard. I have seen a letter from the agent at Bremen in which it is remarked, as if in explanation of reduced prices, that the ley of the ore is lower than formerly, but this affords no explanation whatever. It is true that a few of the first shipments were richer both in silver and copper, but lately the ley has varied very little. We know perfectly well the value of the ores, computing the copper it contains at its market value, and the silver at the standard which has until lately been universally recognised, but I have failed to follow sufficiently close to the arbitrary reductions which have recently been made. To show the difference of prices I may mention that one lot sold in Germany, Aug. 10, 1872, having an assay value there of \$231 per ton of 2000 lbs., exclusive of the lead which it contained, sold for \$238.79 per ton; while another lot sold Oct. 27, 1873, having an assay of \$215 per ton, exclusive of a similar proportion of lead, sold for only \$171.45. Showing a difference of \$50, or 10l., per ton of 2000 lbs. for ores of equal assay.

*For remainder of Meetings see to-day's Journal.]

MINING AT LAKE SUPERIOR.—The following are given as the general results of the native copper mining of the South Coast of Lake Superior in the North-Western Mining Journal of Hancock, on Jan. 7:—"The total assessments on the 10 mines equalled \$3,070,000, and the dividends equalled \$13,610,000, showing a balance of clear profit of \$10,540,000, or at a rate of 400 per cent. The least sum expended on either of these mines (the National) before it paid a dividend, was \$100,000. The famous Calumet and Hecla Mine, the richest of them all, and probably the richest in the world, as shown by Mr. D. D. Ashley, of Boston, in his pamphlet on the Copper Mines of Lake Superior, had been worked for five or six years, the expenditure by assessments being \$600,000 before it paid its first dividend, which was in December, 1869. The following statement of the assessments and the products of the copper mines of the South Shore of Lake Superior, are taken from the above-mentioned pamphlet (1873) by Mr. O. D. Ashley:—"Assessments levied as nearly as can be ascertained since the commencement of operations in 1845—\$17,290,500. Approximate statement of ingot copper produced, and its value: Copper, 135,075 tons; its value, \$75,308,820."

INSTITUTION OF CIVIL ENGINEERS.

The annual *conversazione* of the President of the Institution of Civil Engineers, held on Tuesday evening in the western galleries of the International Exhibition building, South Kensington, was very numerous attended, and the President (Mr. THOS. E. HARRISON) and Mrs. HARRISON may well be congratulated upon having made the meeting at once enjoyable and instructive by causing a large number of scientific novelties in addition to the ordinary International Exhibition objects to be represented, not the least interesting being the delicate and ingenious apparatus of Mr. WILLIAM CROOKES, F.R.S., for demonstrating the attraction and repulsion accompanying radiation, and used by him in illustration of his paper upon the subject recently read before the Royal Society. The portions of the apparatus which attracted most attention were the pith bars suspended in air of different degrees of rarefaction. Firstly, there is a bar of pith suspended by a delicate cocoon fibre in a glass bulb, from which the air is subsequently removed by means of an ordinary Sprengel pump, and in this case strong repulsion is shown when radiant light or heat, be it only that from the finger, is allowed to fall on one end of the bar. This repulsive action is greatly diminished when the vacuum is not perfect, and as shown in the second bulb, from which the air is exhausted only until the barometer gauge shows a depression of 12 millims. below the barometer, ultimately disappears altogether, for in this case the pith bar remains motionless, though radiant light or pith be permitted to fall upon it. And in the third bulb, which contains air at the atmospheric pressure, the very opposite of the first results are observed, and the movement indicates attraction, when radiant light or heat is permitted to fall on one end of the bar.

In further illustration of the subject Mr. Crookes exhibited a glass beam, with plates of platinum at each end, suspended at the centre by means of a torsion thread of glass, and furnished with a reflecting mirror. A ray of light from a lamp a few feet off is reflected from the mirror on to a scale, thus rendering visible the movement of the glass beam when radiant light or heat falls on one of the terminal plates of platinum. In another case he has a mass of magnesium suspended from a fine platinum wire in a tube, forming a seconds pendulum. At the lower part two copper wires pass through the glass, and are connected with a platinum spiral, the other ends of the wires being attached to a galvanic battery. The platinum spiral is ignited by touching a key which turns the current on and off. Thus the radiant light and heat have not to pass through glass, but fall direct on to the suspended magnesium. When the apparatus is full of air the ignited spiral attracts the metallic mass, and the attraction still remains as the exhaustion proceeds. The attraction is strong when the barometric gauge shows a depression of only one-tenth of a millim. On continuing to work the pump the attraction gradually diminishes, until, when the gauge has become appreciably level with the barometer, no movement whatever is observed when the spiral is made hot. If the mercury pump be now allowed to work briskly for several hours the gauge does not appear to rise, but the ignited spiral begins to exert repulsion. Ultimately the repulsive action of radiant light or heat becomes stronger than was its attractive action when air was present.

The barometric position of the neutral point dividing attraction from repulsion is found to vary with the density of the mass on which radiation falls, and in a less degree, on the intensity of radiation. In the case of pith it is seen to lie at about 12 millims. below a barometric vacuum, whilst with a metal it is within 1-10th of a millim. of a vacuum. It is seen, therefore, that radiant light or heat has an attractive or repulsive action, according to the medium in which it acts, corresponding results being furnished by cold. In the radiating influences of the sun, passing through the quasi vacuum of space, Mr. Crookes continues, we may have a power more than sufficient to account for the changes of form in the lighter matter of comets and nebulae; and we may learn by that action, which is rapid and apparently fitful, to find the cause in those rapid bursts which take place in the central body of our system, but until we measure the force more exactly we shall be unable to say how much influence it may have in keeping the heavenly bodies at their respective distances. Attraction being developed by radiant heat under influences connected with air, it is not easy to conceive how it will be produced for cosmic purposes by heat: true, the upper surface of our atmosphere must present a very cold front, and this would lead us to suppose the existence both of attraction and repulsion, but how to harmonise them is by no means apparent. So far as repulsion is concerned we may argue from small things to great, from pieces of pith up to heavenly bodies, and find that repulsion shown between a cold and warm body will equally prevail, when for melting ice is substituted the cold surface of our atmosphere in space, for a lump of pith a celestial sphere, and for an artificial vacuum a stellar void. In the radiant molecular energy of solar masses may at last be found that "agent acting constantly according to certain laws," which Newton held to be the cause of gravity. Although the force spoken of is clearly not gravity solely as we know it, it is attraction developed from chemical activity, and connecting that greatest and most mysterious of all natural forces—gravity—with the more intelligible acts of matter.

Not far from the apparatus just described was the ingenious little instrument which attracted so much attention at the Royal Society's Soiree—the Compound Pendulum, devised by Mr. S. C. TISLEY, for securing a permanent representation of Lissajous's sonorous vibration curves. The instrument, which is constructed by Mr. Tisley's firm (Messrs. Tisley and Spiller), and has already been described in the *Mining Journal*, consists of two pendulums, swinging at right angles to each other, continued above their points of suspension, and having their upper ends connected with each other by two light rods forming two sides of a square. These rods are attached to the pendulums by ball and socket joints, and at the angle in which the rods meet a glass pen is fixed, in order that the motions of the pendulums may be properly recorded. By the instrument in question the object sought is attained most perfectly, and at the same time it is free from inconveniently delicate or complicated mechanism. It will, of course, be understood that all the adjustments are made with the same scrupulous care as is necessary in philosophical instruments generally, and the beauty and accuracy of the tracings produced by Mr. Tisley's apparatus affords the necessary guarantee for its precision. The evidence of the connection between sight and sound which these figures afford is remarkable. With these pendulums swinging in the ratio 1:2 (this is one pendulum making twice as many vibrations as the other), which represents the octave in music, a very pleasing figure is produced, and the same may be said of the ratios 2:3 = the fifth in music; 1:3, the octave and fifth; whilst the ratios 5:6, or the minor third; 5:8, or the minor sixth, are decidedly less graceful. The instrument is highly sensitive, and thoroughly under control, so that curves of great beauty, and of the precise form corresponding to any particular condition, can be produced with the greatest certainty. Mr. Tisley was kept well employed on Tuesday evening in producing the figures which appeared to be much appreciated by the visitors, especially the ladies, who will, doubtless, preserve them as an interesting memento of the meeting.

Returning to matters more directly interesting to the readers of the *Journal*, mention may be made of the Kainotomon rock-drill, exhibited by Mr. T. A. WARRINGTON, and for which great superiority over the several drills previously introduced is confidently claimed. Amongst its advantages, it is explained that it is much shorter, much lighter, and more readily removed from place to place; requires the turning of only one instead of a number of set screws to fix it in position at any angle; may be fed 3 inches out of stroke, without stopping the working of the drill, an invaluable advantage; is not liable to derangement; has not one-third the number of parts in its construction; all stuffing-boxes and parts requiring adjustment are dispensed with; is so simple in its construction that any ordinary labourer or miner can drive it, simply having to turn on the motive-power and feed the drill; that the rotation is compulsory and regular; that 40 lbs. pressure only is required to work

it, and a saving of over 50 per cent. in iron and flexible piping. It is further claimed that the Kainotomon, which can be driven equally well by either air or steam, will bore the hardest rocks, such as granite, quartz, gneiss, ironstone, whinstone, chert, limestone, &c. It progresses at the rate of 3 in. to 1 ft. per minute, according to the size of the machine and the nature of the rock bored. The larger machine bores holes 3½ in. diameter, and will progress at about double the rate of the smaller drill. It can be used at any angle and in any direction, and the larger machine will drill and clear itself to a depth of about 20 ft. A properly tempered steel drill used in it will penetrate through about 10 ft. of granite without sharpening, whereas 2 in. would be about the average if worked by hand. Any ordinary blacksmith can dress the tools, swages for the purpose being supplied with each machine. As a motive power for underground machinery, or where the driving power is at a distance to be infinitely superior to steam, owing to the facilities with which air at a high pressure can be transmitted through long distances of piping without appreciable loss of power, and the assistance to ventilation in underground works caused by the escape of the air after it has performed its duty in the machinery. To meet all necessary requirements, special attention has been given to the design and manufacture of air compressors, and a form which has given the proprietors of the Kainotomon satisfaction is strongly recommended to mine and quarry proprietors, not only for working rock drills, but also for coal cutters, steam pumps, hauling engines, &c. The utmost regard, in the design of these air compressors, has been paid to strength of construction and simplicity of arrangement; they are so made that the maximum pressure is obtained in the compressor when the steam cylinder is capable of exerting its greatest power, thereby rendering their action perfectly regular and noiseless, with great economy of steam. They are constructed to deliver all the compressed air at a high pressure, the air cylinder being kept perfectly cool by a water tank surrounding it, and by an ingenious self-acting system of lubrication. The whole of the parts are readily accessible for lubrication or examination.

A modification of Carr's disintegrator, which itself bore a striking resemblance in principle to that embodied in an old patent for crushing hard substances by throwing them forcibly against a wall, and has, therefore, baffled the ingenuity of many competent engineers to discover how economy could reasonably be hoped for, was exhibited by Mr. EDWARD WILSON, of Bermondsey. He encloses within a circular casing a rapidly rotating steel disc, with numerous steel beaters secured on each side; the disc divides the casing into two compartments, serrated on their internal peripheries. The material to be ground is fed into the centre of the mill, and, coming into collision with the beaters, is dashed into atoms against projections on the side of the casing or the serrated periphery. The grinding is regulated by the hand-wheel, which alters the position of the disc, and also by means of several valves in the discharge, whereby the material may be ground to any degree required. It is claimed that, besides simplicity and strength, and the great variety of work this machine will do, it has many great advantages over other modes of grinding. There are no sharp or cutting edges; but the material is dashed into atoms by the blows from blunt beaters revolving at high velocity, whereby the great friction, wear and tear, and consequently loss of power in the ordinary mode of grinding between two working surfaces, are now brought down to the minimum; therefore, it does its work much faster, and with a far better result.

An excellent sample of Murray's Patent Brick-Making Machinery was exhibited by Messrs. T. MIDDLETON and Co., of Southwark. The machines combine Murray's patent lubricating solid die and Murray's patent cutting table, and accomplish the much desired end of working a continuous or non-intermittent stream of clay, a very important saving being thus effected in both the power and the labour required to produce a given number of bricks. No brickwork is wanted for the foundation, and the machines can be fixed and set to work in two days; they can, therefore, be removed to follow the position of the clay, if desired, at very little expense, and are very suitable for exportation. As to the action of the table, it may be explained that the clay issuing from the die of the machine is received on one end of the table, and when a length sufficient for from eight to twelve bricks (as may be most convenient, according to the gauge) has passed out it is cut off, as it travels, by the single wire, and passed by hand on to the flat surface, behind a series of fixed cutting wires. A lever is then thrown over and advances the thrust-plate; this, as it comes forward, places the block of clay perfectly parallel with the cutting wires, and carries it up to and through them, dividing it into from eight to twelve bricks, and at the same time depositing them on a moveable board, on which they are transferred to the barrow, without being handled. The chief advantages claimed for the machinery are—Firstly, that 2000 to 3000 bricks more can be made per day with each table than with any other cutting apparatus at present in use. This is effected, not by increasing the speed of the stream of clay issuing from the die, but by avoiding stoppages and waste, as they are continually running, and not more than about 1 in. should be thrown back at each stroke of the table. And, secondly, that the bricks made are of a very superior quality, and accurately true in shape. The clay being pushed through the fixed cutting wires by the thrust-board, the finish of the cut is perfectly clean, and the ends of the bricks cannot be torn or left ragged; the value per 1000 is, therefore, considerably increased.

From the large number of purposes to which Stone-Breakers have been applied, it was not surprising to find Blake's stone-breaker well represented in the exhibits of Mr. H. R. MARSDEN, of Sibley Foundry, Leeds. The Blake's stone-breaker is already in use in such a large number of mines that a detailed mechanical description is unnecessary, but it may safely be said that the recent additions of the cubing jaw and the vertical rock-bar motions have rendered the machine as near as may be perfect. The rock-bar motion is especially applicable where counter shafts would be objectionable, or where a high speed of shafting cannot be obtained, as in the case of water or horse power. The machine is stated to be the result of many years experience in pulverising and ore crushing, and is the most powerful and efficient machine yet introduced, assisting the stamps now in use by reducing the hardest ores to the finest gravel. It is understood to be fast displacing the old system of rolls, the new motion being quicker in its action than the eccentric motion at half its speed. The improved cubing jaw is intended for use when it is desirable or essential that the reduced material should be well and evenly broken up to a regular gauge and cubical form, as more particularly in the case of road-metal. The construction of this jaw is simple, and consists in an extension of the lower end, and giving a curved form backwards to the movable jaw; thus the orifice of delivery is made to terminate a parallel channel of some 3 or 4 in. in length, wherein the corrugations of the fixed and movable jaws are so arranged as to alternate the one with the other, and the action of this jaw leaves very little to be desired with regard to the evenness and regularity of the resulting samples of broken stone. The combination of the steam-engine, breaker, and screen upon one bed has previously been noted. This combined machine is useful for the breaking up and disintegrating of all kinds of ores for the ironmaster and the miner in general, of coprolites and other materials for the manufacture of cements, concrete, manures, &c., &c. limestone for blast-furnaces, also for grinting emery. For these purposes the jaws can be changed according to the special degree of comminution desired; and this system is being adopted to replace rolls in various operations of grinding, on account of the fineness and evenness of the so-ground resulting material. A machine thus calculated to operate upon the most refractory materials, exercising powerful strains and destructive effects, while remaining itself comparatively unaffected, and capable of withstanding without material depreciation the great and constant fatigue of such operations, is, it must be admitted, a valuable adjunct to the manufacturing processes in which it is available; and it also reflects credit upon its designer, inasmuch as nothing short of extreme simplicity in action and working parts, combined with judicious proportions and strength in construction, could withstand the destructive efforts exercised, or limit them, as they are required to be limited, solely to the material to be reduced. It appears that the price of the machine varies from 60l. upwards, according to the amount of work to which it is to be

adapted, so that the price would certainly not be any obstacle to its introduction at every mine, and the economy is proved to be enormous. Considerable attention was given to the Rotary Blower exhibited by Messrs. THWAITES and CARBUTT, of Bradford, and of which upwards of 900 are already in use. It had been applied to supplying the blast to the Danks furnace, refineries, Bessemer converters, iron foundries, copper and tin smelting works, &c., and in all cases has given great satisfaction. Amongst the advantages claimed for it are that the blower gives a force blast—a fan does not—thus giving a regularity and reliability of blast never given by a fan, thus saving at least one-half the power, by performing more effectively, at a speed of 200 to 400 revolutions per minute, the same work that a fan would do at 2000 to 4000 revolutions per minute of the fan; that there is a material saving of coke, by producing a more perfect combustion of the coke in the cupola; that it is a machine of great durability, resulting from its construction and comparatively slow motion, there being thus much less wear and tear of the running parts of the machine; that an inferior quality of coke can be used to much better advantage with a blower than with a fan, and, indeed, such as cannot be used with a fan; and that it produces softer and better castings, owing to the more uniform combustion throughout the cupola. It is remarked that the conducting pipes should be of iron, and perfectly tight. No dependence can be placed on tile piping or underground brick flues, which have been used by some, but are entirely unfit to be used with a blower, either for blacksmiths' fires or for a cupola.

The essential part of any smiths' forge is the blast, and the usual plan of producing the blast by bellows is open to many objections. The bellows is liable to be burnt, cut, or otherwise damaged, and once in such a condition the forge is useless. Although the bellows is often enclosed in a box the objections remain. Hitherto, in the effort to reduce the portable forge to such limits as to make it portable, the bellows has been so diminished, and the blast and heating capacity so reduced, as to be of little value for practical purposes. The only alternative to the bellows has till lately been the fan, which is entirely inapplicable to a portable or self-contained forge, because of the very high speed, and the consequent power which is required to produce the blast. The portable forges exhibited by Messrs. Andrew, Handyside, and Co., of Derby, are claimed to be superior to any others in use. They occupy but little room, are convenient in all their arrangements, are operated with little power, and possess great heating capacity. For the ease and readiness with which a strong blast is obtained the bellows is not to be compared to the blower. Although slightly heavier than the sheet-iron forges with bellows, Handyside's forges are much stronger, and form useful and permanent hearths. The parts are few in number, and are all made of cast-iron, as light as is consistent with strength. The fire-plate is shallow, and is cupped in the centre where the blast enters. The blast is supplied by a small Roots's blower fixed upon the base-plate, and the blast enters the fire through one of the patent tuyeres. The driving belt to the blower is of vulcanised india-rubber, unaffected by wet, and as only a moderate speed is required the hand-wheel by which motion is acquired is easily rotated.

Amongst the many other exhibits was one by Mr. F. H. VARLEY, for controlling mill-rolls when receiving their power from a continuously and uniformly driven shaft, so as to avoid sudden shock; but as the invention, which is very ingenious, is referred to in the report of the proceedings of the Iron and Steel Institute, in another column of this day's Journal, it is unnecessary here to describe it.

IRON AND STEEL INSTITUTE.

The third and concluding day's proceedings of the annual general meeting were conducted under the presidency of Mr. CHARLES BAGNALL, of Whitby, and the first paper read was by Mr. GEO. W. MAYNARD, on the "Iron Ores of the Lake Champlain District," and in it the author gave a topographical and geographical description of the district, which extends from the Canadian line down to Washington county, not far from Troy, and placed before the meeting a large amount of information respecting the minerals existing throughout the whole of the United States. He more particularly drew attention to the coal and iron deposits, observing that the chief coal fields were four in number. The annual produce of these fields some 50 years since was about 300 or 400 tons, but at the present time their yearly output amounted to many millions of tons. The iron ores of the Champlain district were, he stated, remarkably rich and comparatively free from phosphorus. Chemical analyses of ores from Washington county showed them to contain an average of 42 per cent. of sesquioxide of iron, 18 per cent. of protoxide, and only a trace of phosphorus. Ores from Essex county showed from 45 to 51 per cent. of metallic iron, and from 0.36 to 0.14 per cent. of phosphorus. At many places the Champlain lake was bordered by steep banks, composed of clay and sand, and abundance of fossils were found belonging to those species which were now inhabitants of the sea on the Atlantic Coast. The water-power of the district was secondary only to Niagara. From the ores themselves the author turned to the companies who had been smelting them, and showed that the trade had undergone enormous expansion of late years.

At the close of the brief discussion which ensued Mr. MAYNARD stated that, as a rule, the ores were mixed for smelting in the United States, and were not used singly. The mixture produced a pig-iron which was exceedingly well adapted for foundry purposes.

Mr. C. BAGNALL, in proposing that the thanks of the Institute be given to Mr. Maynard for his very valuable paper, congratulated him upon its very comprehensive character, and remarked that there could be no doubt that the resources of the iron fields of America were almost inexhaustible, and there would be no limit to the extent of their productions. When we had exhausted our ores, and were on the decline, America would be in the ascendant.

The "Berryman Feed-Water Heater" was described in the next paper, which was read by the gentleman whose name the apparatus bears. He explained that a feed-water heater is an important adjunct to engines and boilers where it is an object to economise fuel by utilising the heat remaining in the exhaust steam after it leaves the engine. To the manufacturer, he said, this saving of fuel was often only a secondary consideration when compared with other advantages, such as the greater durability and consequent increased immunity from repairs or explosions of steam boilers when supplied with feed water free from grease at a temperature of 212° Fahr. This will be more evident when it is considered that all water percolates through soil which is generally impregnated with carbonic acid arising from the decay of animal and vegetable matter; this dissolves the carbonate of lime, and thus many districts are noted for hard water. The minerals causing the most trouble in steam-boilers are known to be carbonate of lime, sulphate of lime, and silicate of magnesia, and salts of iron. It is well known in practice that heating water dissolves carbonic acid, and makes it susceptible of being heated at a lower temperature than 212°, hence the great advantage to be derived from the use of a feed-water heater of proper construction. There are a number of heaters in use, which might be classed as open, tubular, and coil or worm. It has been tried to remedy the effects of grease coming from open heaters by passing the water through hay, but the idea of filtering grease from boiling water is now generally known to be impracticable. When sulphuric or other acids are used for rendering the fibrous matter in fat, their action when heated in steam-boilers is another bad effect of the use of open heaters. Their construction also renders necessary and wastes the power of two pumps, where it is required to draw water from any source from which no pressure can be obtained that will cause water to flow into the heater. One pump is, therefore, required to raise the water, and another to supply the boilers from the heater. If a supply of water can be obtained of greater pressure than that carried in the boilers it is not available, as, owing to the construction of this class of heaters, the water would overflow into the exhaust pipe of the engine; hence a pump is necessary under all circumstances, and must also pump hot water. The tubular heater has defects caused by the unequal expansion and contraction of the tubes by fastening them in a perpendicular line at both ends. To this may be added the fact that even if the tubes have the requisite heating surface to heat the water to the boiling point, so as to make the minerals insoluble, and give facilities for blowing them out of the heater, this is hardly practicable with a tubular heater, as the tubes do not contain a sufficient quantity of water to allow time for the deposits to settle after they are made insoluble by the heat, owing to the action of the pump, which keeps the water in a state of constant agitation in the tubes. In such cases, whatever deposits are made except at the expense of considerable time and trouble. The coil or worm heater has through it, which absorbs power, due to the friction of the water in passing through it, and in all cases the impurities in the water must pass into the boiler, or properties of the metal. For his own heater Mr. Berryman claims the ability of the steam tubes to expand and contract with varying temperatures, without causing fastening in both heads. The capacity of the heater for containing a large quantity of water, which requires sufficient time for it to become settled and thoroughly heated before being fed to the boiler; the facilities for cleansing the heater. The in all places where there is no water pressure; and of avoiding the constant trouble and risk of overflowing the feed water into the exhaust pipe, or which most open heaters are subject. The feed-water reaches the boiler at a temperature of 212° Fahr., and this high result is consequent on the large amount of heating surface

and the constant passage of the exhaust steam through the tubes, which takes place whether the boiler is being fed or not. There is no place in which the water of condensation can lodge in the tubes, and there is, therefore, no loss of power, which would otherwise be incurred by driving it through them, as in horizontal tubes. This heater has also the additional advantage of increasing the power of non-condensing engines by the action of the cold water on the outside of the tubes in the lower part of the heater, which gives results to some extent similar to that of a surface condenser.

The "Pernot Rotary Puddling Furnace" was described in a paper by Mr. PETIN, of Paris, read by Mr. D. FORBES, the foreign secretary. It was stated that at first the process did not seem to promise much, but it is now unsurpassed by any in use in France. In this furnace, in its present enlarged form, charges of 18 cwt. of fine iron (900 kilograms), obtained from charcoal pig, or 22 cwt. of ordinary iron made from common pig are obtained at each operation. The waste amounts to about 3.7 per cent., based on a production of 90 tons of fine ore. The consumption of fuel is from 32 to 24 cwt. (from 1100 to 1200 kilograms) per ton; this with inferior coal containing 20 per cent. of ash. The cost of production, from figures taken in the books of the firm of Messrs. Petin and Gaudet, compared with that of the production of the ordinary furnaces, shows, in favour of the new system, an economy of at least 1.12c. (40 francs) per ton. The above is for charcoal pig, which constitutes a specialty of Messrs. Petin and Gaudet's works. At the forges de l'Horne, comparative experiments are at present going on, and the results of the first day's working seem to indicate an average loss of 6 per cent., and a consumption of fuel of about 24 cwt. per ton of fine iron. In regard to the production of shaly iron, it varies according to the nature of the pig employed; but it is known that it ranges from between double to treble the quantity obtained in an ordinary puddling furnace. With pig iron from "Pouzin" the manufacturers have made 4½ tons per run, which operation lasts about two hours. One ton of this pig gives nearly 19 cwt. of bars (940 kilograms). It is a curious sight to see 17 or 18 bars drawn successively from the same furnace, the last bar being as hot and as free from cracks as the first one, and remarkably clean in appearance. As regards the quality of these different products, it is better than that given by ordinary furnaces. Professor Jordan, has remarked as a real fact, ascertained by practice, that both in this furnace and in the Danks furnace the mechanical action was superior to the manual. He attributes this superiority to the mode of oxidising. In the old furnace it is always the same layer of iron which is subjected to the action of the scoria, and the parts touching the bed or bottom do not come within the influence of this action. In the rotary furnace, with its inclined bed or bottom, the different particles come successively in their sheets, just as they are dragged along by rotation into the upper region of the furnace, and there they are not submitted too long to the oxidising action, because immediately after this they dip down again into the bath in the lower part of the furnace. The advantages of the new furnace, such as they may be deduced from the present memorandum, are:—1. Increase in production, as no doubt can be entertained that it will double the production of the old furnace with the same Martin furnace. 2. Decrease of nearly one-half in the consumption of fuel. 3. Decrease in the same proportion of the working expenses, general expenses, &c. The cost price, resulting from three weeks' experiments of all kinds, reaches 9½ a ton, starting from 6½ 10s. as the cost per ton of the raw materials employed; whereas, supposing the same items in the case of a Siemens-Martin furnace, the cost price of the metal obtained would have come to 10½ 10s., or 1½ 10s. more per ton. 4. The repairs of the arches and other parts of the furnace are very easily and rapidly made. The cost of a furnace may be estimated at 16000 l.; three furnaces, producing from 15 to 20 tons per 24 hours, could be made to replace two Bessemer converters, so that a little less than 50000 l. could be made to produce as much as a cupola and converter, and the product obtained would be at a cost of 9½ a ton, a price superior to that of a "first fusion" Bessemer apparatus. A still greater economy will be realised by getting the iron direct from the blast-furnace, and running it direct on the "rotary hearth." This process can be applied as easily to a small production as to a large one, doing away altogether with those gigantic machines which characterise the Bessemer process. A small firm may have its one furnace limited to the production of its wants, and a large company may put up several of them.

The paper on the "Spathic Iron Ore Districts of Europe," by Mr. CHARLES SMITH OF BARROW, which was read by the General Secretary, is of especial interest at the present time, because it is the raw material from which spiegel-eisen is most conveniently produced, and spiegel-eisen is an essential element in the Bessemer process for the manufacture of steel. Three or four years since it became a question whether it would be possible to utilise, for Bessemer steel purposes, the largely increasing make of suitable pig iron, in consequence of the small quantity of spiegel-eisen brought into the market, most of which was derived from Rhenish Prussia. It was, therefore, most important to know if the existing production could be increased, and if it were possible to obtain additional supplies from fresh districts. To answer these questions Mr. Smith made a number of journeys to most of the localities where spathic iron ore was known or believed to exist, and would now beg to lay before the Institute the main results of these enquiries. As will be seen, the prospects were, on the whole, decidedly unfavourable in the older districts, whilst no newer ones have been developed; although, if the railway system in the south of the Austrian empire were extended, Styria, with Carinthia and Carniola, should be able to produce large quantities of ore. In the late summer of 1872, when in Sweden, we found that the small make of spiegel-eisen in that country promised to be indefinitely extended, by the opening of mines of a peculiar magnesian magnetite, from which that species of iron could be made without the addition of the spathic carbonate. In the same year experiments in England proved the possibility of making a high-class spiegel-eisen by the use of mixtures of Spanish ores. By these fortunate circumstances the Bessemer steel trade was relieved from its dependence on the Rhenish spathic iron mines; but it remains a singular fact how nearly one of the greatest industries in the world was temporarily paralysed by a deficiency of a subordinate mineral. Chalybite, the white carbonate of iron, occurs in numberless localities; but it is seldom found in any workable quantity, and still more rarely unaccompanied with the sulphurets of iron, copper, lead, and zinc. Manganese is an almost invariable companion. In England chalybite occurs, in very beautifully crystallised forms, in most of the lead districts; but never in any bulk, except in the district of Somerset, Cornwall, and Devon. In Somerset chalybite, of the purest character, is found over a considerable area, extending on to Exmoor, in the north-west of Devonshire. The mines in the Brendon Hills, belonging to the Ebbw Vale Company, have produced large quantities of ore, by which that firm have been enabled to manufacture, at their Mounmouthshire works, a high-class spiegel-eisen. Until very recently this company was the only one in England that made this iron; and if it had not been for the late discoveries of the owners of the Somerset mines must have remained in that condition, as the spathic ore raised in Durham and Cornwall was inadequate, and probably unsuitable, for the regular manufacture of any considerable quantity.

The chalybite of the Brendon Hills occurs in highly irregular veins, running through Devonian clay slate, under almost identical geological conditions to that of Rhenish Prussia. The veins vary from mere strings to upwards of 20 feet in width, though only rarely attaining this maximum size. They appear to dip, generally, at an angle of about 45 degrees, and, at least in some cases, descend to a considerable depth. When we visited the district, in 1871, the workings at one mine were down 600 feet; but at that depth the veins had contracted considerably. The best qualities of ore from Somerset and Germany are almost indistinguishable, whilst the inferior English mineral is not so much contaminated with sulphurets of iron, copper, &c. Strings of red hematite run through the Brendon Hills ore, and often give it a dark tinge. Throughout the Cornish and Devonian mountains, specimens of chalybite are common, and not unfrequently these are very beautifully crystallised; but none correspond with the spathic ore of Somerset and Germany, used in the spiegel-eisen manufacture, which is compact and crystalline, and never, as in Cornwall, either crystallised or amorphous. In this country, the largest quantities of the iron carbonate occur at Perran and Marazion; but they are probably the "backs" respectively of lead and copper lodes, rather than indications of greater deposits below chalybite. The perfection of the crystallised forms of this mineral in Cornwall would militate against the probability of the discovery of one in bulk. In all the spathic iron districts separate crystals are either entirely unknown, or of very small size. In Devon some of the veins of a white variety of spathic ore has been worked, in Weardale, from the carboniferous limestone.

In France chalybite occurs in several mining localities, but never, it is believed, in any workable quantity, although there are, or were until very recently, some furnaces in the neighbourhood of Bayonne where small quantities of spiegel-eisen were made. The chalybite used was raised on the Spanish frontier, near Irun. The mineral wealth of Spain is so great, and its geological features are so various, that sooner or later chalybite may, perhaps, be found in quantity, but at present none is known to exist, except that at Irun and some in mines near Barcelona; it is also asserted to exist in the Pyrenees, and in the Basque mountains. In the latter localities are now commercially inaccessible. At one time it was believed by many that the great mass of red hematite at Somorrostro, near Bilbao, was metamorphosed chalybite, and that this ore would be found in depth, but during our visit there we could learn nothing that corroborated this theory, which is now abandoned by most, if not all, of its supporters. Chalybite veins, as they approach the surface, usually, if not always when the vein is large, become brown hematite; but we have not met with any where the upper portion has turned to red hematite, or where that mineral has been immediately associated, except in the strings in the Somerset ore. Notwithstanding the absence of chalybite, the Spanish iron ore have had a very marked influence on the spiegel-eisen trade; as, through recent discoveries, by their use, this metal has of late been made in England to so great an extent that soon we may expect to be wholly independent of the German masters, irrespective of any supplies that may be imported from Sweden. In Portugal chalybite has not been found; but in the south of the kingdom there are evidences of large deposits of highly magnesian iron oxides, that may prove eventually to be as valuable as the purest chalybite for the production of spiegel-eisen. The export of iron ore from Portugal is almost nil, notwithstanding that there can be no doubt but that this country possesses great stores of it. It may, indeed, be a question whether this small kingdom might not rival most of the States of Europe, for its size, in its deposits of iron. In the South, especially, judging from surface indications, the deposits of ore are large and rich. Very much highly magnesian iron ore, which may, probably in the future, be in greater request, and of more value than at the present time.

There can be no doubt, Mr. Smith continues, as to the vast mineral stores that exist along the northern coast of Africa, although as yet so little developed. In Algeria, where he had obtained rich specimens of ores of iron, lead, and copper, a more liberal Government, and a less official rule, might in a few years, by granting concessions that would attract emigration, raise the mining interests of the colony to a position of great importance. No iron ore mine in Europe, not even the richest in the Furness and Cumberland district, equals in output that at Mokdi-el-Hadid, near Bona, which yields over 300,000 tons per annum of magnetite of high quality, similar in composition, but slightly different in appearance, to that of the south of Spain, and to the richer varieties of Sweden. In the same eastern part of Algeria there are many deposits of iron ore known, but unworked. More to the centre of the colony there are some fine deposits of brown hematite; especially those at Sonnah, near Blidah, which in depth may possibly change to chalybite. The Sonnah mines are being rapidly developed, and their output is already large. To the eastward of Algeria, in the adjoining state of Tunis, a French official, one of the very few Europeans who have explored the country, states that the mineral wealth is even greater than in Algeria, whilst the climate is superior; but no mining enterprise could expect to prosper unless endowed with most unusual guarantees, under a Government so extremely bad that, with a magnificent climate

and a soil that once made northern Africa the granary of Europe, the present inhabitants are steeped in poverty, and only six years ago a famine carried off a large proportion (it is said 25 per cent.) of the population of the capital.

But of all continental deposits of spathic iron ore the best known are those of the Rhenish provinces. These occur in two districts—one near Coblenz, and the other to the east of Cologne, in the neighbourhood of Siegen. Chalybite is found over a large extent of country in the Siegen district, and over a more limited area near Coblenz. The mineral occurs in irregular veins running through Devonian granuwacke, but these are usually either mere strings or too small to be commercially valuable. Even when the veins are larger they are commonly deteriorated by copper and iron pyrites, and frequently also with the sulphurets of lead and zinc. It is rare for the chalybite to be free from manganese, but this is not a disadvantage for the spiegel-eisen manufacture. The number of mines producing paying quantities of ore is small, and is even decreasing, notwithstanding that large sums have been expended during the last few years in searching for fresh deposits. By far the best mine is that at the Stahlberg, which is also the oldest, having been worked continuously for upwards of 500 years. It was fortunate enough to be allowed to mine the main workings, which exhibit an enormous mass of the purest ore. The mineral raised here is alone in being free from manganese, or which account it acquired a superiority before the era of spiegel-eisen, which it now retains from its purity and bulk. It may be a question whether any existing mine in the Siegen district is worth more than a very few years purchase, except those at the Stahlberg. The manufacture of German spiegel-eisen is a delicate and uncertain operation, far more so than the Swedish, whilst the quantity made of best quality, such as is exported to England, is small, probably not exceeding 30,000 tons per annum.

The only country in Europe that appears capable of any large production of spathic ore is Austria. Immense deposits exist in Styria, Carinthia, and Carniola, and in the latter two districts charcoal iron of high quality has been manufactured from them. Unfortunately, the districts are very isolated, and but little developed by railways, whilst the supply of fuel is a source of considerable difficulty. The make of spiegel-eisen has of late years increased, but is still inadequate for the Austrian demand. Spathic ore occurs in these provinces over a very large area, and much more abundantly than anywhere else in the world, so far as known. The largest deposit is near Eisenerz, where the ore forms a bed from 200 to 600 ft. thick, which appears to cap the high mountain of Erzberg. Notwithstanding the depreciation in the value of the spathic carbonate of iron, when the purity and size of these deposits are considered, we cannot doubt but that eventually they will prove of great value when existing difficulties as to transport and fuel are lessened. In Sweden there does not appear to be any deposits of spathic iron ore. The wonderful veins of ore that are found throughout a great part of the centre of the kingdom are either magnetite or red hematite, the latter often barely distinguishable by the eye from the former. From these the whole of the Swedish iron is manufactured, with a trifling exception made from bog and lake ores. The deposits of iron ore in Sweden are so enormous and so rich that were it not for the difficulty of fuel, transport, and labour, scarcely any in Europe could compete with them. Very frequently they possess special advantages, either from their extraordinary purity, as at Bispingen, where much of the ore contains 70 per cent. metallic iron, or from their immense quantity, as in the Filipstad and Grangesberg districts, or when, as at Dannemora, with a low iron percentage, the mineral is capable of producing, without the addition of a flux, the very highest class of iron. Manganese is frequently present in the Swedish iron ores, but in one lode of greatest size, in Dalarna, it occurs in an unusual form in the shape of knebelite, an exceedingly rare silicate of manganese; this is so intimately associated with the main body of magnetite that the whole mineral mass contains about 13 per cent. of metallic manganese. From this ore, without any other mixture, the highest class of spiegel-eisen is produced, at present in a comparatively small quantity, but within a limited time the make may most materially increase, and it appeared to him that there was no reason why this limited Swedish district within a few years should not have an annual production of spiegel-eisen equal to the present European consumption of the metal. The vein of ore can be traced along the surface of the ground for some miles; it has an average width of 200 ft., and has been proved to 500 ft. in depth without any sign of exhaustion. Spathic iron ore is found in many other localities in Europe besides those named. In Northern Italy it is believed to exist in some quantity, but it has not been worked; in Eastern Germany it occurs in many places, but the quantity has been too small to effect the trade. In the Mineralogical Museum at Copenhagen, many splendid specimens from Greenland and the Feroe Islands, but these localities are too much out of the way for the ore to be at present commercially valuable, although large quantities are found connected with the crystalline deposits of Greenland.

As far as is known, chalybite does not occur in America in sufficiently large quantities of pure mineral to produce spiegel-eisen. The small amount of that metal which has been manufactured in the States has been made from Franklinite, an oxide of iron, manganese, and zinc; this is primarily treated for zinc, and spiegel-eisen is made from the residue. But the process is very expensive, and the trade is almost, if not altogether, extinct, leaving the Americans as customers in European markets; this production, however, demonstrated before the advent of Swedish and Anglo-Spanish spiegel-eisen, that this iron could be made without the presence of the spathic carbonate. This rapid review of all the main localities for spathic iron ore shows how limited are the deposits of that mineral, with the exception of those in some of the inaccessible districts of Austria; and there can be no question that the Bessemer steel trade only narrowly escaped serious difficulties, as to the supply of spiegel-eisen. But in this case history once more repeated itself, and as soon as there was a strong demand for this particular metal perseverance and skill produced the required material from unexpected sources.

The last paper read was that on "Coupling Power for Rolling Mills," by Messrs. F. N. VARLEY and FURNESS, who described a means for controlling or reversing mills which received their power from a continuously and uniformly driven shaft, where the fly-wheel picked up the accumulated momentum, and the shaft to all practical purposes might be considered to be driven at a uniform rate. A means for quickly arresting a rotation body might be obtained by altering the direction of the force so as to avoid a sudden shock. The accomplishment of this idea was explained by design, and it was shown that in the case of any sudden strain on the wheel the shaft and attachment would not receive the shock, and that the force of the blow would be spread over a period of time sufficient to destroy its intensity.

With regard to the next meeting, the President (Mr. J. Lowthian Bell, M.P.), who attended to close the proceedings announced that, owing to a pressing invitation which they had received, their autumn meeting would be held at Barrow-in-Furness. At their last meeting a cordial invitation had been given to them to visit the United States but they were compelled, with great regret, to decline it for the present. He should convey to their friends in the United States their high appreciation of their kind invitation. There were invitations from Prussia and Sweden which at present, as in the case of the United States, they must decline. It was further announced that the Barrow meeting would be held probably during the last week in August.

AMERICAN INSTITUTE OF MINING ENGINEERS.

Although less than three years have elapsed since the organisation of the American Institute of Mining Engineers, the amount of information brought forward, as evidenced by the list of papers read before the several meetings, and collected in the recently-published volume of "Transactions," can leave no doubt that the association has already obtained a prominent position amongst the scientific organisations of the United States. It was considered by a few of the leading engineers who met together in April, 1871, that the great development of the mines and metallurgical works in the United States during the last few years, accompanied, as it had been, by the investment of enormous sums of money in purchasing lands and in the erection of improvements, required that advantage should be taken of the accumulated knowledge of engineers, superintendents, and others in mastering the problems which constantly present themselves for the action of those similarly engaged, and to promote the interchange of the varied experience of those engaged in such occupations, it was proposed to establish an American Institute of Mining Engineers, to hold periodical meetings in the great mining and metallurgical centres, where works of interest, such as mines, machine shops, furnaces, and other metallurgical works can be inspected, and the members exchange their views and consult for mutual advantage upon the difficulties encountered by each. The favourable reception which this proposition met with may be judged of from the circumstance that at the Wilkes Barre meeting, held in the following month, more than fifty persons had become members, and five important papers were brought forward, and as the result of the discussion upon one of them—that on the Waste of Coal in Mining, by Mr. R. P. Rothwell—a committee was appointed to consider and report upon the subject. The Bethlehem meeting, held in August, 1871, was well attended; the number of members was doubled, and nine valuable original papers, in addition to the preliminary report of the committee just mentioned, were submitted. At the Troy meeting, in the November following, the strength of the Institute was further increased by 54, and the meeting was made particularly interesting by the invitations which the members had an opportunity of accepting to visit the works, &c., within reach. No less than fourteen papers, fully equal in character to those brought before similar and older societies in Great Britain, were submitted, as well as several informal communications, conveying a large amount of information. And at the Philadelphia meeting, in February, 1872, there was an equally satisfactory accession of members, and an equal variety of papers read.

The honour of reading the first paper before the Institute fell to Dr. R. W. Raymond, and his paper on the Relation between the Speed and Effectiveness of Stamps, with those on Mine Ventilation, by Mr. S. Harries Daddow and Mr. Daniel Hoffman, all communicated at the first meeting, afforded an ample earnest of the thoroughly practical character which the founders intended to give to the Institute. From the large number of papers read during even the first year of the existence of the Institute it is impracticable to enumerate their mere titles, but amongst them were those on the Attainment of Uni-

formity of Bessemer Steel, by Mr. Thomas M. Drown; on the Efforts heretofore made by the Japanese to produce Pig-Iron by our methods, by Prof. W. P. Blake; on the Economy of the Blast-Furnace, by Prof. F. Prime, jun.; on Blast-Furnace Slags, by Mr. Kenneth Robertson; on Rolling Mill Machinery, by Mr. A. L. Holley; and on the Utilisation of Blast-Furnace Slags, by Prof. Thos. Eggleston, of the Columbia College School of Mines, several of which have already been noticed in the *Mining Journal*, are worthy of special mention; and it must be acknowledged that in closing the Philadelphia meeting the President was fully justified in congratulating the Institute upon the success of its first four quarterly meetings, and remarking that the character of the papers presented, the vigour and good temper of the discussions, and the great social enjoyment and professional profit which all had derived from the meetings had been so many pledges of the future prosperity of the Institute. No one, he continued, had been urged to join the Institute; its doors are open to the profession and to the public interested in its objects, but it is not a beggar for members or associates. Assured in its vitality and progress, it is assured also in the expectation that the mining engineers and metallurgists of the country will gather round it not for its sake but for their own. As to the last remark, it was undoubtedly true when the President made it, now two years ago, and at the present time it is equally so, because the association has increased still more in prosperity, through the number of members and associates having so increased as to give the Institute a greater command of funds for extending its utility. The American Institute of Mining Engineers has already done much to direct increased attention to the enormous advantages derivable from availing of mutual intercommunication amongst mining engineers and those connected with them, as well as from the scientific investigation of matters in which its members may be concerned, and which may have given unusually good results or led to annoying difficulties, so that if its present energy be continued it cannot fail to become one of the most successful of modern organisations.

FOREIGN MINING AND METALLURGY.

Quotations for copper have generally exhibited firmness at Paris, but transactions have been quiet. Chilean copper in bars, delivered at Havre, has made 80*l.* per ton; ditto, ordinary descriptions, 78*l.* 10*s.* per ton; ditto, in ingots, 86*l.* per ton; English tough cake, 85*l.* per ton; and pure Cornish minerals, 81*l.* per ton. The Marseilles copper market has been inactive, and quotations have not varied. The German copper markets have also been very quiet, transactions having been confined to some purchases to meet the requirements of consumption. There has been little business passing in tin at Paris, but prices have somewhat hardened. Banca, delivered at Havre or Paris, has made 108*l.* at Paris; Straits, ditto, 104*l.*; and English, delivered at Havre or Rouen, 106*l.* per ton. Tin has presented little animation at Marseilles. The German tin markets have been generally firm, without, however, any material change in prices. Lead has been quiet at Paris. French lead, delivered at Paris, has made 20*l.* 8*s.*; Spanish ditto, delivered at Havre, 20*l.* 16*s.*; English ditto, delivered at Havre, 20*l.* 8*s.*; and Belgian and German, delivered at Paris, 21*l.* per ton. In Germany the lead markets have been generally heavy, but prices have not varied much. Business in zinc has been quiet at Paris, but small transactions have been effected tolerably regularly. Silesian zinc, delivered at Havre, has made 23*l.* 4*s.*; and other good marks, delivered at Havre or Paris, 22*l.* 16*s.* per ton. At Marseilles, rolled Vieille Montagne zinc has brought 32*l.* 16*s.* per ton; and other marks ditto, 32*l.* per ton. In Germany business has continued rather inactive.

Small orders have dropped in from day to day at the French forges and rolling-mills; but, notwithstanding the low price of pig, supplies of it have been laid in very sparingly; the blast-furnaces have accordingly witnessed an accumulation of stocks about them. Refining pig has been dealt in at 2*l.* 17*s.* 6*d.* to 2*l.* 18*s.* 6*d.* per ton in the Meurthe-et-Moselle and in the Nord; second fusion has been dealt in at 3*l.* 12*s.* and upwards. The proprietors of French rolling-mills, being tolerably well off for work at present, have maintained merchants' iron firmly at between 8*l.* 16*s.* and 9*l.* 4*s.* per ton, while rails have made 10*l.* per ton. The mechanical construction workshops in the North of France have been somewhat tried by the absence or insufficiency of business; the fall of 30 to 40 per cent. which has taken place in coal and metals has enabled them to make some concessions, and to obtain in consequence a few more orders, but it has not been sufficient to revive business, which has rarely been so quiet as it is at present. Most of the mechanical firms in the district in question are, however, doing all they can to keep their workpeople employed, and to assure them occupation. On the other hand, the works in the basins of the Loire and the Centre are well employed, their great establishments being fairly overdone with orders. The production of steel is especially being actively developed; the French navy is successfully employing steel on a large scale. Upon the whole, it must be said that the state of the French iron trade is not brilliant, and that it suffers from the general depression and stagnation in affairs.

If pig-iron did but revive from the disastrously low price to which it has at present fallen, and there were less competition from Luxembourg, the condition of the Belgian blast-furnaces would not be so very bad. But, unfortunately, the adverse circumstances indicated exist, and weigh upon the market for pig in Belgium. The Belgian iron manufacturers, forges, rolling mills, and construction workshops are not without employment. The Belgian forgemasters are not running after work at present; they have, certainly, not a superabundance of orders, but they can go on working at suitable prices. Rails range in Belgium between 9*l.* 4*s.* and 9*l.* 12*s.* per ton. The imports of iron into Belgium in the first two months of this year amounted to only 23,000 tons, against 35,000 tons in the corresponding period of 1873. There was a reduction of 17,000 tons in the imports of iron into Belgium from England, but, on the other hand, the German importation increased from 800 tons to 7600 tons. The exports of iron from Belgium in the first two months of this year presented a slight augmentation, having been 38,300 tons, against 35,700 tons in the corresponding period of 1873; February alone contributed 21,000 tons to this year's total. The exports of Belgian iron to the Zollverein declined 6000 tons in the first two months of this year as compared with the corresponding period of 1873, but the exports increased 2000 tons to England, 4000 tons to France, 4000 tons to Italy, and 2000 tons to Switzerland. These totals are far from being discouraging, upon the whole. The Sambre and Meuse Mines and Ironworks Company will pay, July 1, a dividend of 12*s.* per share.

A small number of orders have been received by the Belgian coal trade, but, upon the whole, the market still remains in a dull and languid state. Coking coal and coke reflect the bad condition of the Belgian metallurgical industry, and have been selling at almost all prices, even at 16*s.* per ton at Liège. Washed coke of good quality has remained at 1*l.* per ton at Liège. In this basin the coal trade must be said to be still quieter than at Charleroi. The imports of coal into Belgium in the first two months of this year amounted to 61,000 tons, or 2500 tons less than in the corresponding period of 1873. The decrease was proportionately greater in February than in January. The exports of coal from Belgium are also decreasing, having been only 421,000 tons in the first two months of this year, as compared with 691,000 tons in the corresponding period of 1873. The exports of coke from Belgium in the first two months of this year amounted to only 71,000 tons, as compared with 137,000 tons in the corresponding period of 1873. These totals do not indicate, as hitherto, the disadvantageous results of the Ruhr basin, but they demonstrate tolerably clearly the slackening in affairs and the depression in business which exists just at present. It appears that the canalised Sambre will be closed for 45 days during the current summer; the other Belgian canals will be closed for from five to 25 days. The North of Charleroi Collieries Company paid, May 15, a dividend for 1873 at the rate of 3*l.* per share.

The French coal trade has continued dull and heavy. This state of things cannot be regarded as accidental, and we should not be surprised if it lasted for some time longer. There has been no further serious fall in prices. Quotations do not exhibit much firmness, but purchases are not made at all freely, and weeks elapse without a serious contract being concluded. This result is due to

the depression which weighs upon all the great industries of France, and which would not be removed even if coal fell 2*s.* per ton more upon the French markets. The French Administration of Public Assistance will set a coal contract of some importance on June 6.

FOREIGN MINES.

RICHMOND.—Telegram—"May 19: Nearly week's run; two furnaces; \$23,000."

MINERAL HILL.—Mr. Oakes, April 27: We have raised during the week 60 tons, of an average grade of 84*l.* per ton, at a mines' cost, including store, materials, and sorting waste dumps, of \$920-55.

SANTA BARBARA (Gold).—Report for March: The directors have received advices from Paris, dated April 14. Capt. Tregellas reports that during March 704 tons of mineral was stamped, yielding 2297 ozs. of gold, equal to 3-262 ozs. per ton. The working expenses of the mine for the same month were 108*l.* 0*s.* 3*d.*, and the value of the produce was 97*l.* 4*s.* 6*d.*, showing a loss of 11*l.* 15*s.* 9*d.*. Capt. Tregellas attributes this unfavourable result as being mainly due to the small size of the lode operated upon, the mine force being compelled to stoop for mineral under No. 2 shaft, where the lode is narrow, in order to reach No. 3 bottoms, where the lode is wider and more auriferous. The surface works are progressing satisfactorily. The expenditure during March, on erection of new stamps, &c., was 110*l.* 6*s.* 3*d.*.

COLORADO TERRIBLE LODGE.—May 21: The agent's advices, dated April 28, received May 18.—The appearance of the mine is very satisfactory, all the stopes and levels being in good mineral. A very fine vein of ore is reported in the bottom of the shaft, now being sunk to admit of the 7th level being run; this vein the underground captain states is the best that he has seen. Assays from the 2nd and 3rd levels, 514 ozs. and 709 ozs.—Concentrated Mineral: My intention is to ship all ore from 200 ozs. and upwards. As soon as the machinery is working well I will at once commence to reduce the number of hand dressers, and eventually all ore but the pure mineral will have to pass through the concentration works. This machinery, when once in full work, must necessarily reduce the expenditure and add considerably to the income.

UTAH (Silver-Lead).—J. Longmaid, April 27: Since my last, of April 16, I have been so fully occupied that I was unaware so long a time had slipped away. I had a good deal of trouble in getting the various launders sufficiently steep for the crushed ore to run through, and, as I before explained, I have had to make alterations in the speed of some of the machinery; now, however, I have the pleasure to inform you that the whole of the machinery is working very satisfactorily, and I hope by the end of this week to have a good parcel ready for sale. I find we cannot jig clean ore in once jiggling, and have to try the lutch work, but this will not make much extra cost. Since the 16th inst. we have had some very sharp frost, which prevented our working; but now the weather is delightful, and I think the winter is really over, or at least as much of it as will interfere with our work. I will write again in three or four days, and report progress. Having no one about the place that knows anything about dressing has been a great drawback, and I have been obliged to take the tools in hand and work myself, to teach the men. I have now engaged a Cornishman, who understands building, &c., and I think I shall get on better with him. Doubtless, Mr. Argall has kept you informed on money matters, &c., which I have not attended to for some time, having been so fully engaged other ways.—Fire-tank: It is now completed, is partly full of water, and available in case of fire.

CECIL CREEK (Gold) MINES AND WATER.—T. B. Ludlum, May 2: Every department is now working well, but owing to delays early in April some of the claims are not yet ready to clean up, in consequence of which I to-day send you a cablegram that I will report on May 8. I am doing everything possible to produce large results. The machinery is now working well, and the Yankee Tunnel is being pressed with vigour; I am working from the face, and also from the shaft. The Jehoshaphat is being opened as fast as men and water can do it. We have worked our ground sluices down so low that we can now use powder, and for this purpose are now running a drift in which I intend to explode a blast of 250 lbs. It is my intention to clean up on the 5th inst., replace the paving, fire this blast, and commence the next run, washing away the gravel thus loosened. Then I expect satisfactory results. This run the gravel has been so hard to attack (being above it) that we could wash off but little, the aim being to wear down our ground sluices and relieve the bank, so that powder could be effective, consequently I do not anticipate large results from present run. I will clean up this time the Pacific, Central Home Ticket, Jehoshaphat, Gem, and perhaps the Gold Run. The clean up from the Gem will be only a partial one, as we have not reached the bank and have not been enabled to make a complete run. The Home Ticket will not be very satisfactory, as our promising bank has turned to bed-rock, which has raised up (so to speak) and cut our gravel almost entirely off, leaving us but a low bank to wash from. You can assure our shareholders, notwithstanding the loss of time, we are to have a profitable season.

BLUE TENT CONSOLIDATED HYDRAULIC GOLD MINES OF CALIFORNIA.—C. W. Tozer, April 28: My last to you bears date the 26th inst., since then nothing worthy of special mention has occurred at the mine. Washing with three giants in Enterprise claim has proceeded uninterruptedly, except the delays incident to moving up the giants nearer the points of attack. The pulling in additional boxes of new flume as required, and occasional short stoppages for blasting boulders, and pipe-lay to insure an advantageous use of the water. As water is the most expensive element used in our operations, I never employ it until every preparation is made to secure the full benefit of its use. In commencing the washing through the shaft connecting with bed-rock tunnel at South Yuba claim I have been compelled to exercise great caution, and proceed rather slowly, with somewhat frequent interruptions, to prevent blocking up the tunnel at the head; this has sometimes occurred in hydraulic mining. A very few moments stoppage of the flow of the water and its burden of earth and rock would fill up the shaft, and, perhaps, long distance of tunnel, causing great delay and expense to move the obstruction; this danger is now mainly passed. We have four very fine undercurrents in use at South Yuba, and I take both pleasure and pride in saying that both the undercurrents and all our newly-erected appliances there work most beautifully. It is not boasting to say there is not in the State a more complete or better running hydraulic apparatus than that on our South Yuba claim; we are using there through one nozzle about 700 in. of water. About 100 in. is supplied at this season of the year by our lower or Mount Vernon ditch, and the balance is purchased from the South Yuba Canal Company. Our lower ditch does not bring in its water high enough for any of our present washings, except the South Yuba, and, consequently, while moving pipes, giant, and making the various preparations at South Yuba we were obliged to lose the use of this water; this, at a season of the year when the ditch is full of water, has involved a loss of at least \$1000.—Free Water: Could not avoid this without the purchase of more than \$1000 in new pipes, giants, &c. I shall be able to announce another clean up about May 10. Our flumes and undercurrents look well for a good return.

EXCHERQUE (Gold and Silver).—Mr. Lewis Chalmers writes:—April 27: The tubes for the boiler have not yet arrived. The Aecia tunnel was driven 5 ft. The cross-cut east from main tunnel was driven 5 ft., and it is now in casing. On Thursday I put all the men to shovel snow, as I can see that if I do not get rid of it this way the road will not be open till July or August (15 or 20 ft. deep in shady places). I have got the flume almost rebuilt across the creek.

L.X.L. (Gold and Silver).—Mr. Lewis Chalmers writes: April 27: Since last report I have finished timbering the north drift, and have driven 2 ft. in making the level of 197 ft. The lode is well defined, having a good foot wall and hanging wall, and measures 3 ft. in width. On Thursday I put all the men I could spare to open the road to get up provisions to the mine. I have had two men cutting wood, my winter supply being exhausted. Two of the men are sick.

NEW ROSARIO.—Extracts from Mr. M. V. Cumins' letter, dated Mineral del Monte, April 13: "Shortly after closing for the last packet I received a letter from Mr. Loneragan, the director of the American hacienda, and forwarded the same to you at once. Accompanying the same note from Mr. Loneragan were a few lines in which I stated that I would not act in the disposal of our ores before receiving definite instructions from the board. However, on reconsideration of the terms proposed by Mr. L., and on making the calculation submitted herewith, I found that the offer for ores of moderate ley was not very unreasonable, and have, therefore, treated for the sale of 500 cargass (about 75 tons), guaranteed 13 mes., for the sum of \$3500 (200*l.*). Mr. Loneragan and his assayer have sampled the ores, and I am expecting to learn the result of the assays this afternoon. Should I receive the proceeds of the sale this week, I will, on Monday next, place 40 men more on the stopes, which will produce enough work for both whims day and night, and give us a large extraction.—San Manuel Level: The end in this level continues to look very well indeed; better I do not expect to see it until we reach the junction where rich smelting ores may be expected. At present we are taking out Quemazon and Aguazado ores of very good quality. The most part of the men at the moment are stopping from the cross cut to the plat, where we require rather more space for the stuff.—San Guillermo Level: The lode in this end looks very promising indeed, and the plates it carries are good.—San Juan: In this level the stopes continue equally as good as when I last wrote, and yield good average ley ore. Since the date of the last letter, somewhat over 50 cargass of ore have been dressed, but I shall not sample for another week. The development of the mine is attracting much attention both here and in Mexico, and I have visitors almost daily. Parties are also constantly coming and making surveys to ascertain whether any sets can be taken up on the lode."

BATTLE MOUNTAIN.—Capt. Richards, April 30: The progress made in drifting at the 188, north of new shaft, has been satisfactory. The distance driven is 72 ft. north of Daniel's winze, or 152 ft. from said shaft. The lode for the whole of this distance has presented a most promising appearance, and at points, as before advised, some very rich ore in red oxides and green carbonates of copper. In the stopes in the 70 ft. level, south of Pryce's shaft, the lode produces some good ore, principally in green carbonates. We have raised during the week 150 sacks.

BENSBURG.—C. Craze, May 16: Victoria Shaft: The lode in this shaft is of about the same value as last reported—20*l.* per fathom; the pumps here are working well, and the men making fair progress in sinking.—New Shaft: The lode in the level, east of this shaft, is not looking so well; there is a little lead in it, but not enough to value. The lode in the level, west of this shaft, is disordered by a crossing; there is a little lead ore in it for dressing, and I hope, as we get free of the influence of the crossing referred to it may again improve. The men in the level west of open-cast have driven south 9 ft., but we have found nothing of any value in that direction. The stoep in the north-east side of open-cast is not so good as it has been, having come upon a large quantity of pyrites. The second new jigger having been delivered on the mine on Saturday last, we shall commence to fix it with all speed.

[For remainder of Foreign Mines see to-day's Journal.]

A FORTUNATE INVENTOR.—Mr. C. F. Loiseau has disposed of his right to manufacture artificial fuel from coal dust in Great Britain, under his English patents, for the sum of \$60,000 gold, and a royalty of 25 cents per ton, when coal sells at from 15*s.* to 25*s.* per ton in London, the royalty varying with the price above or below these figures. The purchasers agree to manufacture a minimum amount of 100,000 tons the first year, and after that to keep the market supplied, on failure of which the inventor can manufacture for himself. This at the beginning, supposing coal to sell at the above figures, would give the inventor the neat income of \$25,000 for the English market alone. Mr. Loiseau is organising a company for the manufacture of the fuel in this country.—*Scientific American*, May 16.

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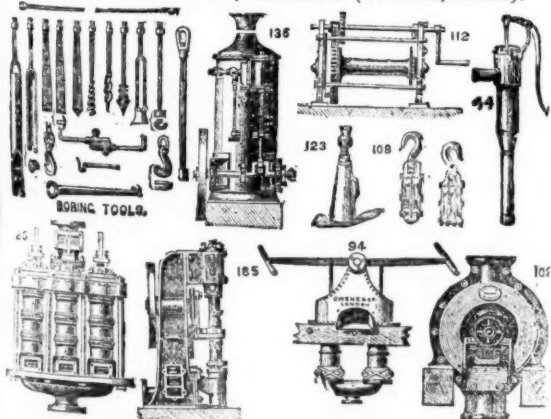
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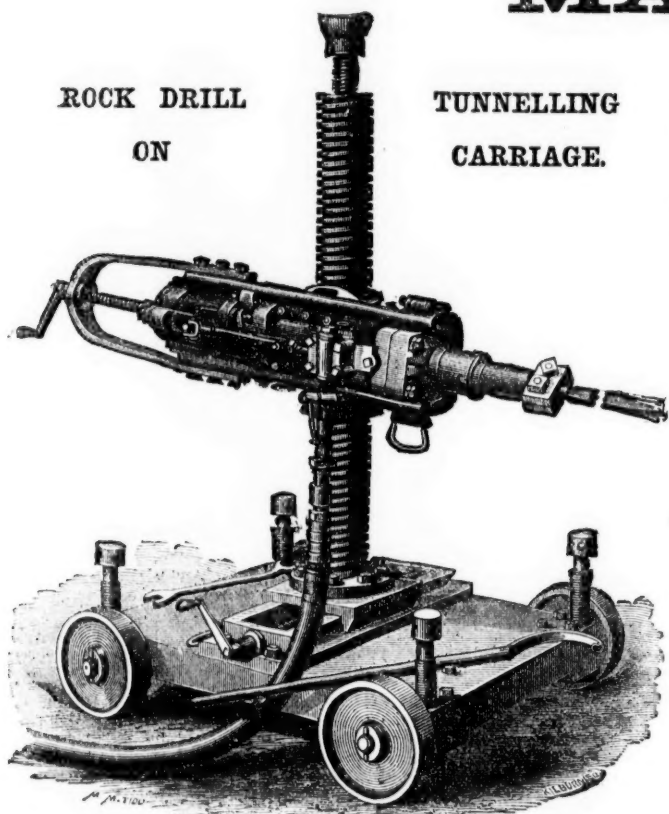


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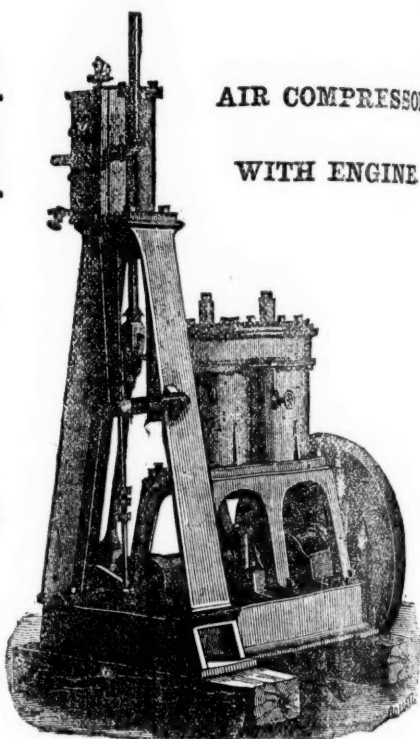
THOMAS BROWN & CO.
96, Newgate Street, London.

Sole Agents—

WILSON, McLAY & CO., 2, Talbot Court, LONDON, and
87, St. Vincent Street, Glasgow.

Sole Makers—

CRAVEN BROTHERS, MANCHESTER.



AIR COMPRESSOR WITH ENGINE

Adapted for Driving Rock Drills, Coal Cutting, Pumping, and Underground Machinery, or where the Motive Power has to be conveyed long distances.

The Drills (in 5 Sizes) can be Mounted on any Description of Carriage or Support, according to the Nature of the Work.

"BURLEIGH" MACHINE VERSUS HAND DRILLING.

Extract from Paper read before the British Association at Bradford, 1873, on Brain's System of Mining and Shafting Sinking at the Drybrook Iron Mines, Forest of Dean, using the "Burleigh" Rock Drilling and Air Compressing Machinery:
(Shaft 10 ft. Diameter.)

COST OF SHAFT BY HAND

During a Fortnight.

Sinkers, twelve, 12 days each, at 5s. 6d.	£39 12 0
Water Fillers, three, 12 days each, at 3s. 6d. . . .	6 6 0
Blasting powder	1 2 0
Total	£47 0 0

Depth Sunk 3 yards—Cost per yard . . . £15 13s. 4d.

COST OF SHAFT BY MACHINE

During a Fortnight.

Sinkers, three, 12 days each, at 5s. 9d.	£10 7 0
Labourers, six, 12 days each, at 3s. 6d.	12 12 0
Engine Stokers, two, 12 days each, at 2s. 6d. . . .	3 0 0
Dynamite, 60 lbs., at 2s.	6 0 0
Electric Fuses (Brain's) 20 per day, at say 6d. each	6 0 0
Coal for Air Compressing Engine, 12 tons small, at 10s.	6 0 0
Oil for engines	0 5 0
Total	£44 4 0

Depth Sunk 5 yards—Cost per yard . . . £8 16s. 9d.

THE ABOVE STATEMENT REPRESENTS WHAT IS NOW BEING DONE AT THE ABOVE MINE.

ADDITIONAL TESTIMONY.

(COPY.)
Messrs. T. BROWN & Co., 96, Newgate Street, London, E.C.

DEAR SIR,—I have much pleasure in informing you that the Rock Drill and High-pressure Boiler, with which you supplied us, are both working extremely well.

I am, yours truly,

The Weardale Iron and Coal Company, vid Darlington, Sept. 6th, 1873.

(For the Weardale Iron and Coal Company, Limited),

J. R. CRONE.

(COPY.)

DEAR SIR,—In reply to yours of 2nd inst., I am sorry I have not time to go into the comparative results of hand labour in sinking with that of the work done by your "Burleigh Drill." All I can say is, that for the last few months it has been giving me every satisfaction, and there is a marked difference in the progress of our sinking operations.

I am, yours truly,

JOHN MAIN.

Crossfield Iron Ore Works, Crossfield Moor Row, vid Carnforth, Sept. 8th, 1873.



VIENNA EXHIBITION, 1873.

THE HIGHEST PRIZE
AND ONLY MEDAL "FOR PROGRESS"
FOR DIRECT-ACTING

STEAM PUMPS,

FOR GENERAL PURPOSES, WAS AWARDED TO



TANGYE BROTHERS AND HOLMAN,

10, LAURENCE POUNTNEY LANE, LONDON, E.C.

AND BIRMINGHAM. (TANGYE BROTHERS), CORNWALL WORKS, SOHO,
FOR

"THE SPECIAL" DIRECT-ACTING STEAM PUMP.

NEARLY 4000

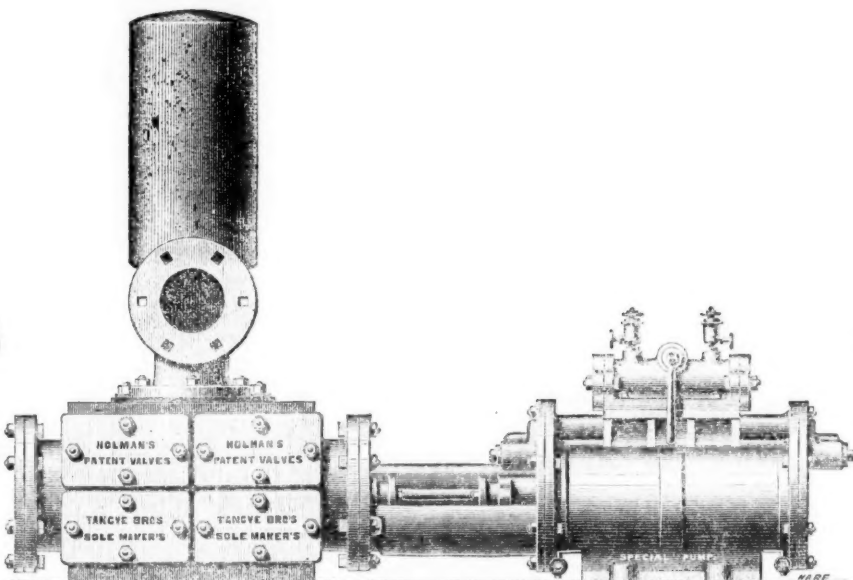
OF

The "Special"

STEAM PUMPS

HAVE BEEN SOLD

SINCE THEIR INTRODUCTION
IN 1867.



200 SIZES

And combinations of

The "Special"

STEAM PUMPS

ARE NOW

MADE FOR EVERY VARIETY
OF PURPOSE.

GREAT REDUCTION IN PRICES.

The following sizes are suitable for low and medium lifts:—

Diameter of Steam Cylinder	Inches	3	4	4	4	5	5	5	6	6	6	6	7	7	7	7	7	8	8
Diameter of Water Cylinder	Inches	1½	2	3	4	3	4	5	3	4	5	6	3	4	5	6	7	4	5
Length of Stroke	Inches	9	9	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Gallons per hour		680	815	1830	3250	1830	3250	5070	1830	3250	5070	7330	1830	3250	5070	7330	9750	3250	5070
Price	£	16	18	20	25	22 10	27 10	32 10	25	30	35	40	30	35	40	45	50	40	45

CONTINUED.

Diameter of Steam Cylinder	Inches	8	8	8	9	9	9	9	9	10	10	10	10	10	10	12	12	12	12
Diameter of Water Cylinder	Inches	6	7	8	5	6	7	8	9	5	6	7	8	9	10	6	7	8	9
Length of Stroke	Inches	12	12	18	12	12	12	18	24	12	12	12	18	24	24	18	18	18	24
Gallons per hour		7330	9750	13,000	5070	7330	9750	13,000	16,519	5070	7330	9750	13,000	16,519	20,000	7330	9750	13,000	16,519
Price	£	50	55	65	50	55	60	70	85	55	60	65	75	90	100	75	80	85	110

CONTINUED.

Diameter of Steam Cylinder	Inches	12	12	14	14	14	14	14	14	16	16	16	16	16	18	18	18	18	18
Diameter of Water Cylinder	Inches	10	12	7	8	9	10	12	14	8	9	10	12	14	9	10	12	14	14
Length of Stroke	Inches	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Gallons per hour		20,000	30,000	9750	13,000	16,519	20,000	30,000	40,000	13,000	16,519	20,000	30,000	40,000	16,519	20,000	30,000	40,000	40,000
Price	£	120	140	110	120	130	140	160	180	140	150	160	180	200	190	200	220	240	240

Intending purchasers are particularly requested to observe the great length of stroke of these pumps as compared with the short stroke of pumps of other makers, as the durability of the machine depends greatly upon this.

ALL THE ABOVE PUMPS ARE FITTED WITH HOLMAN'S PATENT VALVES.

The "Special" Steam Pumps can be worked by Compressed Air as well as by Steam.

MANY HUNDREDS of the PUMPS are being USED for HIGH LIFTS IN MINES, for which purpose they are made with 21, 24, 26, 28, 30, and 32-inch Steam Cylinders, and 36, 48, and 72-inch Strokes.—Prices and further particulars of these given on application.

NEW PATENT CONDENSERS,

Greatly increasing the efficiency and economy of the "Special" Steam Pumps can be supplied with any size.

Agents at Newcastle-on-Tyne: Tangye Brothers & Rake, St. Nicholas-buildings.

BY ROYAL

H. R. MARSDEN,

LETTERS PATENT.

BLAKE MACHINE,**ORE CRUSHERS, WITH THE NEW PATENT CUBING JAW.**

Has received 30 First-class Gold and Silver Medals.

750 NOW IN USE.

ALSO,

**NEW Patent EMERY CRUSHERS,
CEMENT CRUSHERS,
MACHINES for making GRAVEL
AND
ROAD METAL.**

COPROLITE CRUSHERS,

Small Handpower Machines for Crushing Samples, &c.

**SECURES FIRST-CLASS PRIZE MEDALS
WHEREVER EXHIBITED.**

**ARE IN USE IN ALL PARTS OF THE WORLD. IMMENSE
SAVING OF LABOUR.**

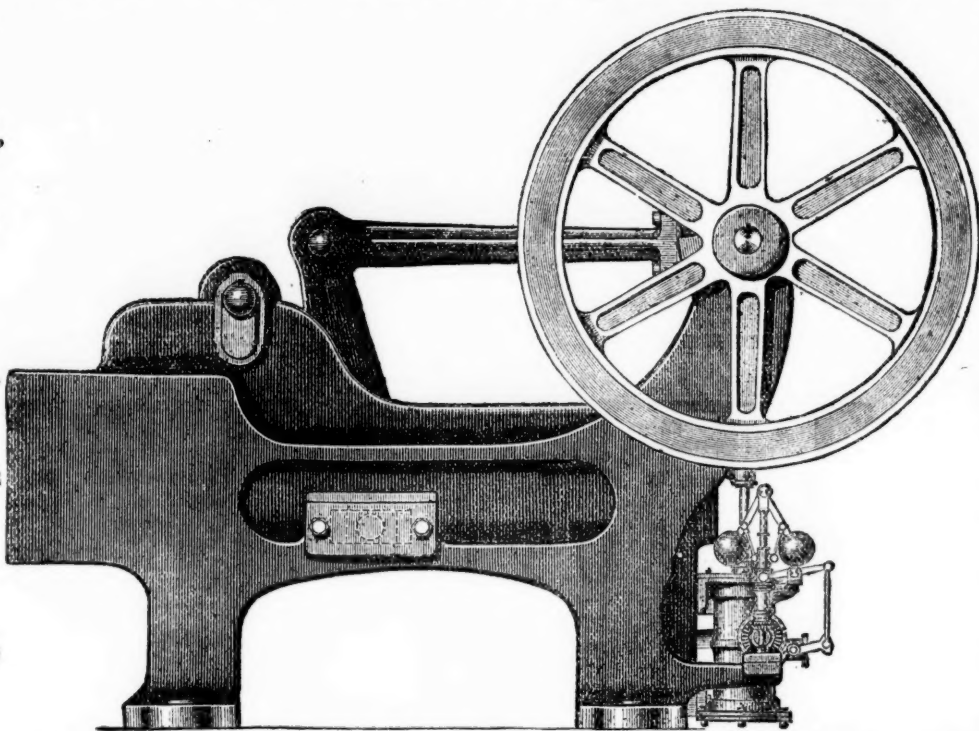
Users write—"It is a fascination." "A wonder." "Your Ore
Crusher is all that we could desire."

For illustrated catalogues, circulars, and testimonials, apply to—

**H. R. MARSDEN, Soho Foundry,
LEEDS,**

ONLY MAKER IN THE UNITED KINGDOM.

H. R. M.'s latest improved PATENT MACHINE to be seen in FULL OPERATION in the Exhibition, London, Stand 6040, Room 2, Class 14, West Side.



To be seen in full operation at the ROYAL SHOW, ST. AUGUSTINE, CORNWALL, June 2, 3, and 4, H. R. M.'s patent 15 x 7 ORE CRUSHER & STONE BREAKER and patent 6-horse power traction engine; also at the BATH AND WEST OF ENGLAND SHOW, BRISTOL, June 8, 9, 10, 11, and 12, H. R. M.'s patent 15 x 7 STONE BREAKER and ORE CRUSHER, & patent improved 6-horse power traction engine.

All are requested to bring samples of any hard materials they may wish to see crushed or broken.

TO COLLIERY PROPRIETORS, MINING ENGINEERS, &c.



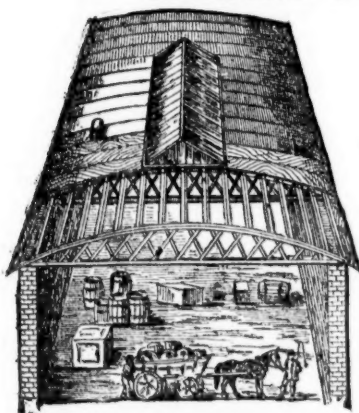
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Steel Colliery Wheels**
WITH
PATENT FITTED AXLES AND PEDESTALS.

Also,
Hydraulic
Cylinders,
Pinions,
Ship-
propellers,
Railway
Crossings,
Skifles for
Ploughs, &c.

Also,
Cross-heads,
Axle-boxes,
Horn-blocks,
Plough-
shares,
Cultivators,
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Fingers, &c.

**Hadfield's Steel Foundry Company,
MANUFACTURERS OF EVERY DESCRIPTION OF
CRUCIBLE CAST STEEL CASTINGS,
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ROOFING FELT,**



FOR
GREAT ECONOMY
AND
CLEAR WIDE SPACE.
For particulars, estimates,
and plans, address—
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ST. BENET CHAMBERS,
FENCHURCH STREET,
LONDON, E.C.;
4, PORTLAND STREET,
MANCHESTER;
OR
CORPORATION STREET,
BELFAST.**

The above drawing shows the construction of this cheap and handsome roof, now much used for covering factories, stores, sheds farm buildings, &c., the principal of which are double bow and string girders of best pine timber, sheathed with 1/2 in. boards, supported on the girders by purlins running longitudinally, the whole being covered with patent waterproof roofing felt. These roofs so combine lightness with strength that they can be constructed up to 100 ft. span without centre supports, thus not only affording a clear wide space, but effecting a great saving both in the cost of roof and uprights.
They can be made with or without top lights, ventilators, &c. Felt roofs of any description executed in accordance with plans. Prices for plain roofs from 20s. to 10s. per square, according to span, size, and situation.
Manufacturers of PATENT FELTED SHEATHING, for covering ships' bottoms under copper or zinc.
INODOROUS FELT for lining damp walls and under floor cloths.
DRY HAIR FELT, for deadening sound and for covering steam pipes, thereby saving 25 per cent. in fuel by preventing the radiation of heat.
PATENT ASPHALTE ROOFING FELT, price 1d. per square foot.
Wholesale buyers and exporters allowed liberal discounts.
PATENT ROOFING VARNISH, in boxes from 3 gallons to any quantity required 8d. per gallon.

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The IRON AND COAL TRADES' REVIEW is extensively circulated amongst the Iron Producers, Manufacturers, and Consumers, Coalowners, &c., in all the iron and coal districts. It is, therefore, one of the leading organs for advertising every description of Iron Manufactures, Machinery, New Inventions, and all matters relating to the Iron, Coal, Hardware, Engineering, and Metal Trades in general. Offices of the Review: Middlesborough-on-Tees (Royal Exchange); London, 11 and 12, Red Lion-court, Fleet-street; Newcastle-on-Tyne (50, Grey-street).

COAL-CUTTING MACHINERY.

W. and S. FIRTH undertake to CUT, economically, the hardest CANNEL, ANTHRACITE, SHALE, or ORDINARY COAL, ANY DEPTH, UP TO FIVE FEET.

Apply.— **16, YORK PLACE, LEEDS.**

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(WORKS AND OFFICES ADJOINING CRADLEY STATION),

Manufacturers of

CRANE, INCLINE, AND PIT CHAINS,

Also CHAIN CABLES, ANCHORS, and RIGGING CHAINS, IRON and STEEL SHOVELS, SPADES and FORKS, ANVILS, VICES, SCYTHES, HAY and CHAFF KNIVES, PICKS, HAMMERS, NAILS, RAILWAY and MINING TOOLS, FRYING PANS, BOWLS, LADLES, &c., &c.

Crab Winches, Pulley and Snatch Blocks, Screw and Lifting Jacks, Ship Knees, Forgings, and Use Iron of all descriptions. STOURBRIDGE FIRE BRICKS AND CLAY.

ARTESIAN BORINGS,

For WATER SUPPLY to TOWNS, LAND IRRIGATION, and MINERAL EXPLORATIONS, may be executed of any diameter, from 6 in. to 36 in., and to any depth to 2000 ft.,

Pistons & Air-pump Buckets fitted with Patent Elastic Metallic Packing
of which upwards of 7500 have been made to March, 1874.

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MAKERS OF LARGE PUMPS AND PUMPING ENGINES.

Improved Valves and Taps for Water, Steam, Gas, &c.**PATENT STEAM EARTH-BORING MACHINE.**

ENGINEERS and MACHINE MAKERS to CALICO PRINTERS, BLEACHERS, DYERS, and FINISHERS.

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ENGINEERS, FOUNDERS, AND LICENSEES.

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MAKERS, by Special Machinery, of PATENTED MECHANICAL INVENTIONS, comprising numerous Labour-saving Appliances and Economisers of Fuel and Motive Power.

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THE FIRST PRIZE MEDAL AT THE EXPOSITION UNIVERSELLE, PARIS, 1867. "For Improved Construction, Excellence of Material, and Superior Workmanship."
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ILLUSTRATED CATALOGUES AND ESTIMATES ON APPLICATION.

Correspondence conducted in English, German, and French.